AUTOMOTIVE INDUSTRIES

AUTOMOTIVE and AVIATION MANUFACTURING
ENGINEERING • PRODUCTION • MANAGEMENT

JANUARY 1, 1954

In This Issue

Ford's Newly-Designed Overhead Valve V-8 Engines
Automatic Welding Lines at Fisher Plant
Completely New Buicks for '54
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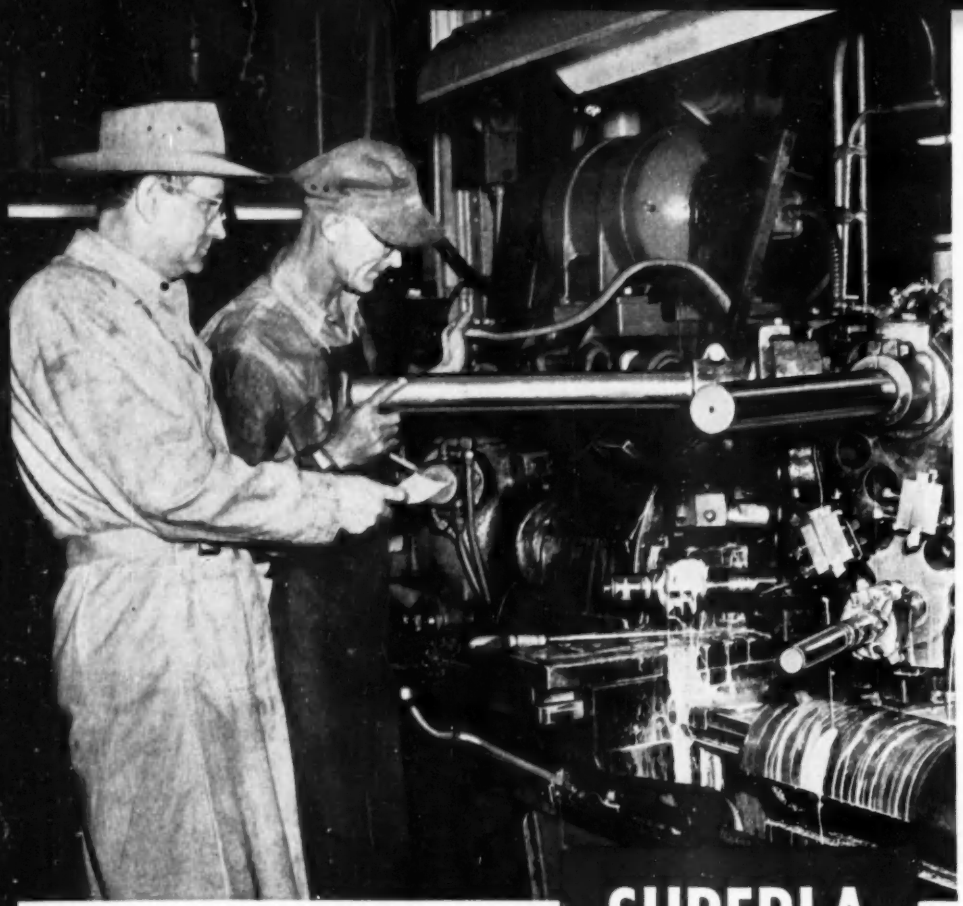

SUPERLA
REG. U. S. PAT. OFF.
Soluble Oil

The Four Wheel Drive Auto Co. benefits 4 ways with →

● Over a period of nearly 40 years, The Four Wheel Drive Auto Co., Clintonville, Wisconsin, has used SUPERLA Soluble Oil on an increasing variety of machining jobs. Shown above is a current operation performed on a semi-automatic turret lathe. The job calls for boring and turning of 1040 steel to produce differential case assemblies.

Company officials report that on this job, as on many other jobs employing milling machines, drill presses, and grinding machines, SUPERLA Soluble Oil has provided these four important benefits: **1.** Mixes readily with cold water. **2.** Forms stable emulsions. **3.** Helps hold close clearances and dimensions. **4.** Helps provide good finish and tool life.

The long and successful experience of The Four Wheel Drive Auto Co. with SUPERLA Soluble Oil testifies to the benefits you can obtain with this outstanding coolant.

The Standard Oil lubrication specialist serving your area of the Midwest has a complete line of metalworking fluids and compounds to offer you. He also has the experience and special training to help you use these products most effectively. You can reach this man by phoning your local Standard Oil (Ind.) office. Or write: Standard Oil Co., 910 South Michigan Avenue, Chicago 80, Illinois.

What's YOUR problem!

R. E. O'Brien, of Standard Oil's Green Bay office, is the lubrication specialist who works closely with The Four Wheel Drive Auto Co. to assure maximum benefits from the use of SUPERLA Soluble Oil.

He is one of many lubrication specialists who make their headquarters in Standard's offices throughout the Midwest. These men have been specially trained in Standard's Lubrication Engineering Schools and, in addition, have a wealth of on-the-job experience. The specialist nearest your plant is ready to give prompt, expert and thorough attention to your lubrication problems.

A phone call to your local Standard Oil Company office will bring this man quickly to your plant—with no obligation to you, of course. Discuss with him the benefits offered you by such outstanding products as:

STANICUT Cutting Oils. These special-duty cutting oils meet today's most exacting requirements and highest production schedules. Grades vary in viscosity and compounding. Each contains the correct proportion of extreme-pressure and friction-reducing ingredients.

STANOSTAMP Compounds. Here are three established products for stamping or heavy drawing operations of either low-carbon or alloy steels. Water can be added to these paste compounds to provide the most economical applications. STANOSTAMPS offer maximum protection for dies and work. These compounds can be readily removed in conventional washing equipment.

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HEAVY-DUTY TRANSMISSIONS

"Engineered-to-order"

High Strength Nickel Alloyed Steels give greater play to the skill of the automotive engineer, because these nickel-containing steels have greater stamina and toughness as well as resistance to wear, shock, fatigue and corrosion. Send us details of your metal problems for our suggestions.

Black Diamond

cuts deadweight . . . adds load capacity

"We manufacture the lightest steel trailer ever built" . . . states the Black Diamond Trailer Company, Inc. of Bristol, Va.

Weight reduction obviously brings basic advantages to trailer users, because less deadweight allows greater payload and, correspondingly, an increase in revenue. Secondary advantages are that every pound trimmed off saves fuel and reduces wear on tires and brakes. As a result, operating costs go down.

To reduce weight without sacrificing safety, Black Diamond uses thin, light sections of high strength, low alloy steel containing nickel.

Nickel alloyed steels of this type provide the same strength as thicker, heavier sections of plain carbon steel. Compared to carbon steels adjusted to provide equal tensile strength, the nickel alloyed steels show superior behavior in fabrication, including welding and cold-forming.

In addition, these nickel alloyed steels resist abrasion and erosion as well as many types of corrosion, and thus lengthen equipment life substantially. Produced under various trade names by leading steel companies, these high strength steels containing nickel along with other alloying elements, provide three basic advantages:

1. High strength, in the as-rolled condition, permitting important weight reductions.

2. Excellent response to usual fabrication operations, including easy forming and welding.

3. Good resistance to corrosion, abrasion and impact.

Consult us on the use of these high strength, nickel alloy steels in your products or equipment. Write us, today.

INCO

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A CHILTON MAGAZINE AI PUBLISHED SEMI-MONTHLY

AUTOMOTIVE INDUSTRIES

JANUARY 1, 1954 VOL. 110, NO. 1

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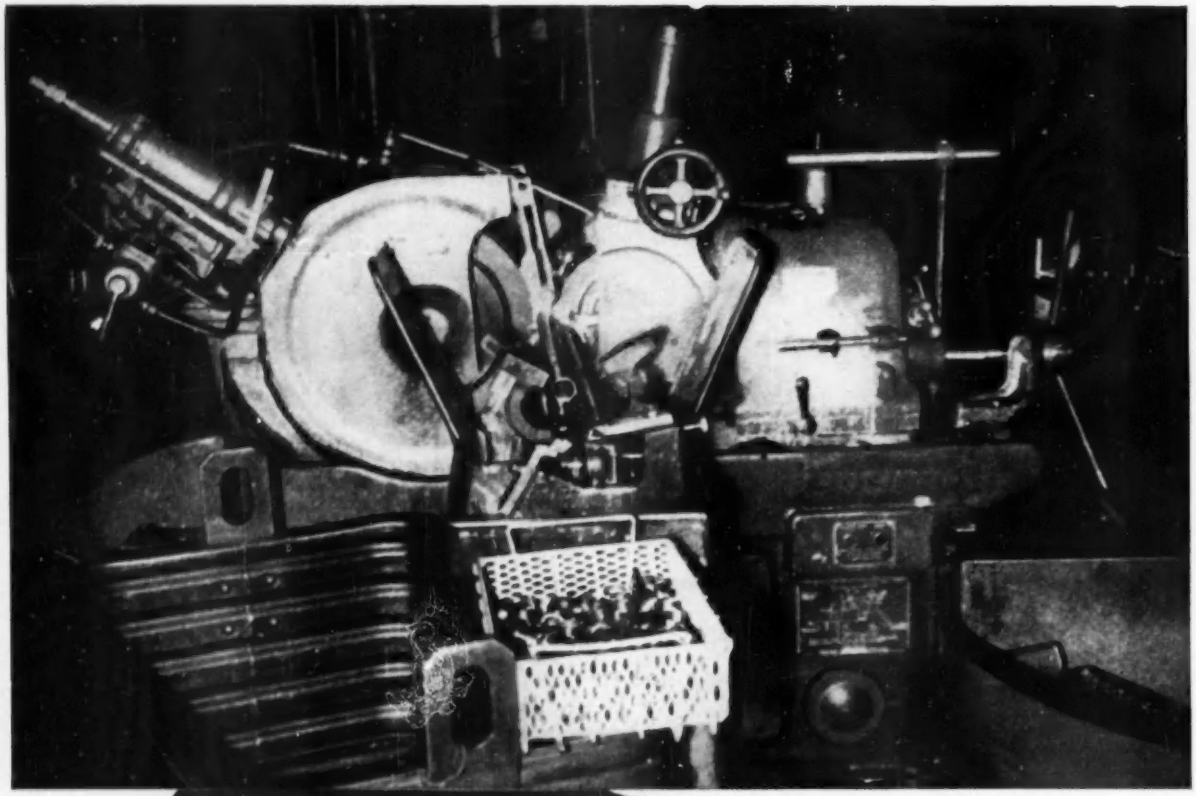

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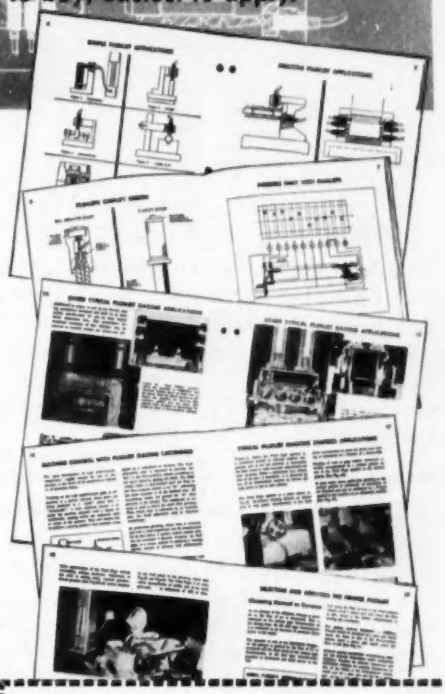

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SHEFFIELD

What is an Alloy Steel?

This is the first of a series dealing with basic facts about alloy steels. Though much of the information is elementary, we believe it will be of interest to many in this field, including men of broad experience who may find it useful to review fundamentals from time to time.

Here is an easy definition to remember: An alloy steel is a steel in which one or more alloying elements have been blended to give it special properties that cannot be obtained in carbon steel.

Or, here is the metallurgical definition: An alloy steel is one in which the maximum specified content of alloying elements exceeds one or more of the following limits—

Manganese, 1.65 pct; Silicon, 0.60 pct; Copper, 0.60 pct

or in which a definite range or a definite minimum quantity of any of the following elements is specified or required within the limits of the recognized commercial field of alloy steels: aluminum, boron, chromium up to 3.99 pct, cobalt, columbium, molybdenum, nickel, titanium, tungsten, vanadium, zirconium, or any other element added to obtain a desired alloying effect.

As a rule, alloy steel is more difficult to make than carbon steel. There are more elements to be kept within specified ranges and, in general, the ranges of the alloying elements are comparatively narrow; hence the mathematical chances for producing off-heats are correspondingly increased. Moreover, most alloy steels require special reheating and cooling to prevent such imperfections as flaking and cracking.

Surface imperfections must be removed from the billets by scarfing, chipping, or grinding. More exacting methods of testing and inspection are necessary to insure uniformity.

WHERE DOES IT PAY TO USE ALLOY STEELS?

Generally speaking, it is advisable to use alloy steel when more strength, ductility, and toughness are required than can be obtained in carbon steel in the section under consideration. Alloy grades should also be used where specific properties such as corrosion-resistance, heat-resistance, and special low-temperature impact values are needed.

In some cases it requires considerable study to determine when and how to use a particular alloy steel to advantage in a product. Where there is any problem or doubt concerning its use, Bethlehem metallurgists will gladly give impartial advice on analysis, heat-treatment, machinability, and expected results.

In addition to manufacturing all AISI standard alloy steels, this company produces other than standard analysis steels and the full range of carbon grades.

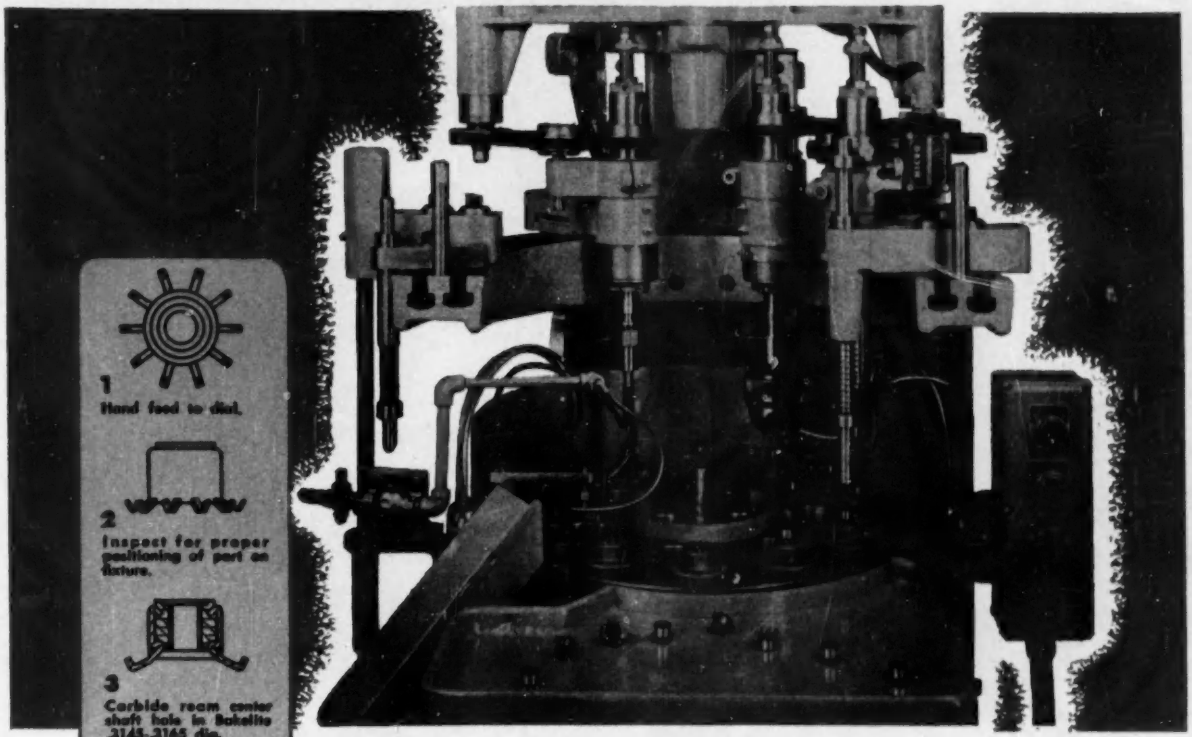
BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.

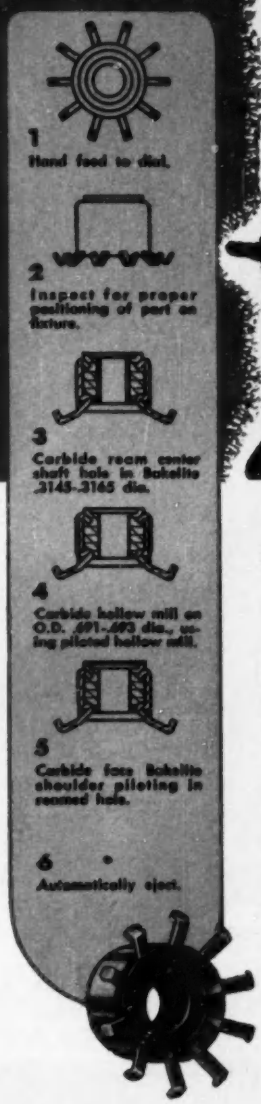
On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation. *Export Distributor:* Bethlehem Steel Export Corporation

BETHLEHEM ALLOY STEELS

BETHLEHEM STEEL

Bodine CASE HISTORY NO. 36




1
Hand feed to dial.
2
Inspect for proper positioning of part on fixture.
3
Carbide ream center shaft hole in Bakelite .3145-.3165 dia.
4
Carbide hollow mill on O.D. .691-.693 dia., using piloted hollow mill.
5
Carbide face Bakelite shoulder piloting in reamed hole.
6
Automatically eject.

PROCESSING A COMMUTATOR FOR A SMALL ELECTRIC MOTOR (Copper, molded in Bakelite)

FEATURING . . .

Carbide tools to (1) maintain high production speeds and longer tool life in extremely abrasive materials; (2) maintain close tolerances on machining operations.

PRODUCTION:

1070 pieces per hour at 85% efficiency. Machine used is the Bodine Model 41-20 tooled as a straight driller. This model can be tooled for drilling, tapping, milling, single or double screw inserting, and assembly operations . . . or any grouping desired. If you require high speed production at low costs, this is your machine.

"You Can't Meet Tomorrow's Competition With Yesterday's Machine Tools"

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AUTOMATIC DIAL TYPE DRILLING, MILLING TAPPING, AND SCREW INSERTING MACHINES

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CHANGE CUTTERS WITH A

TWIST of the WRIST

TOOL UP WITH

CONTINENTAL DRIVE

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It is as simple as this: The Continental Standard Drive consists of integral double driving lugs on the shank of the cutter which engage double abutments in the socket of the holder. Double aligning bearings keep the cutter and holder in rigid alignment. The drive is machined from the solid—there are no pins or loose details. Result—a balanced, positive drive which is non-wedging and practically indestructible.

Available in standard counterbores, spot facers, countersinks—and on special tools such as multiple-diameter cutters, step counterbores, radius and chamfering applications. It is equally applicable for inverted operations.

Order through your Ex-Cell-O representative or direct from Continental Tool Works in Detroit.

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CTW
EX-CELL-O CORPORATION

Continental Counterbores may be purchased individually or in sets. Write on your company letterhead for Catalog 60681.

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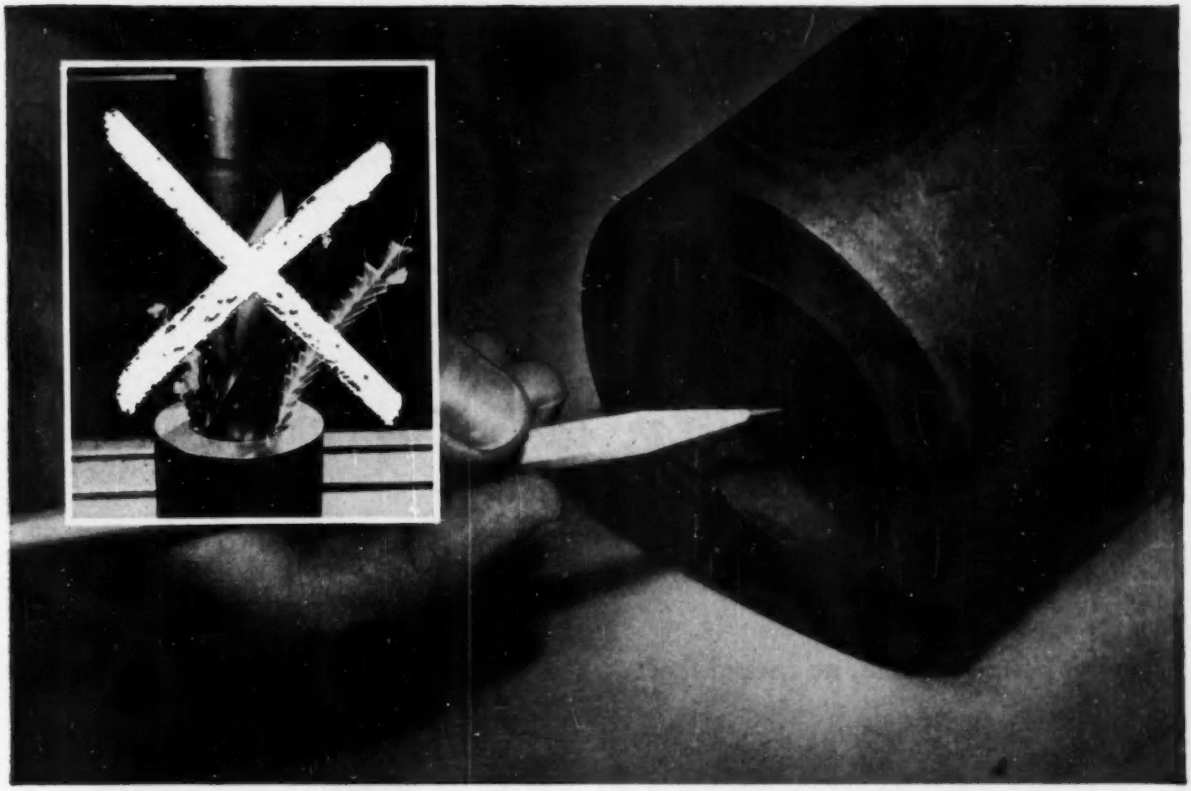
DETROIT 32, MICHIGAN

52-35



Eliminate drilling! Finish boring's the first step with TIMKEN® seamless steel tubing!

DRILLING'S a thing of the past when you use Timken® seamless steel tubing. The hole's already there! You save time and money by starting with finish boring.

Screw machine stations are available for other jobs. The result: You add machine capacity without adding machines.

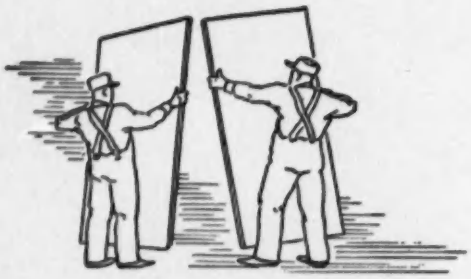
Timken seamless steel tubing saves you additional money because you don't waste steel. All you pay for is the steel you use. We give you the holes.

To make sure you get the most steel per dollar, our engineers will be glad to study your problem and recommend the most economical tube size for your hollow parts jobs.

Timken seamless steel tubing gives you high internal quality because the piercing process by which it's made is basically a forging process. It has a uniform spiral grain flow for greater strength, and a refined grain structure which brings out the best in the quality of the metal. And our rigid quality control makes sure that the quality is uniform from tube to tube and heat to heat. The Timken Roller Bearing Company, Steel and Tube Division, Canton 6, Ohio. Cable address: "TIMROSCO".

YEARS AHEAD—THROUGH EXPERIENCE AND RESEARCH

SPECIALISTS IN FINE ALLOY STEELS, GRAPHITIC TOOL STEELS AND SEAMLESS TUBING



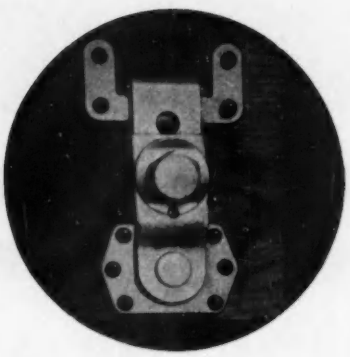
Have you a similar fastening problem?

How a strong structure can be designed for speedy and simple assembly with unskilled labor, no special tools...

The U. S. Air Force wanted a jet-aircraft hangar design that would be portable by air, yet strong; would assemble quickly; be interchangeable, and flexible enough for easy structure modification.

The answer lay in a panel structure using modular units. Armorply honeycomb panels faced with thin aluminum, developed by United States Plywood Corporation, provide lightness, strength, flexibility. Joining one panel to the other in the field with untrained help was a problem until Simmons Fastener developed LINK-LOCK, a simple latching device that operates with minimum wrench pressure on hex nut.

This fastening problem is being successfully met by combining the design ingenuity of No. 1 LINK-LOCK with the proved performance of honeycomb plywood panels.



No. 1 LINK-LOCK—like No. 2 LINK-LOCK—features simplicity, positive action, high strength.

No springs are used in No. 1 LINK-LOCK. Locking action is obtained by rotating a nut that moves a sliding latch in and out of position. Up to 1500-lb. pull-down pressure is available; the device carries up to 4000-lb. tension. No. 1 LINK-LOCKS provide for surface mounting, simplifying installation.

Where can you use it? When you need heavy fastening pressures, resistance to impact, operation in 70-below temperatures—and where ease of action, compactness, and low cost are important factors. Write for a No. 1 LINK-LOCK Data Sheet.

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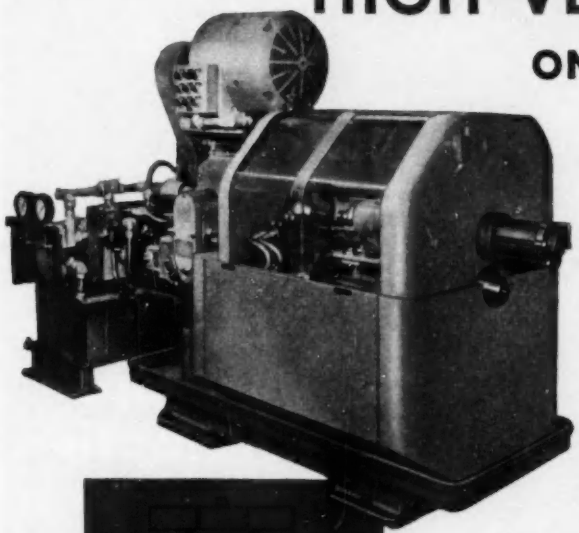


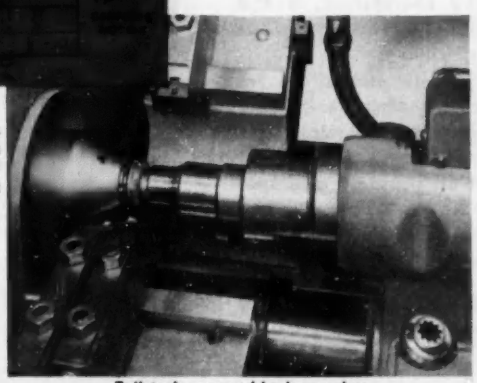
SIDE GEARS
18 Seconds Floor to Floor — 635 SFM

Two 8" Fays, with Automatic Sequential Control, machine all exterior surfaces of the blanks in two operations; one machine for each. The major diameter is 2-15/16" and floor to floor time is approximately 18 seconds in each operation.

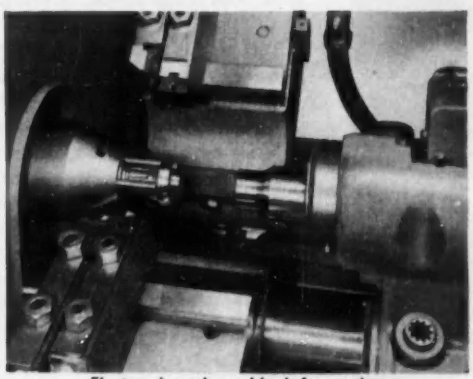
Automatic Cycle—The machines are equipped with automatically operated splash guards and automatically air-operated tailstock rams for pressing the blank onto a splined arbor equipped with automatically operated ejector pins.

The operator places the blank on the end of the arbor, and pushes the cycle start button. *Automatically, the guard closes, the tailstock ram presses the piece onto the arbor and then retracts. The carriage turns, the back arm faces, and at the end of the cuts, ejector pins push the piece onto the loading section of the arbor* from which it is removed manually.

FIRST OPERATION: Note intricate movements of the carriage, which turns the hub, back angle and major diameter. The back arm faces and forms.



Tailstock presses blank on arbor



Ejector pins release blank from arbor

Production management regularly relies upon the engineering services of Jones & Lamson for the latest information on methods, costs, tooling and performance. Why not consult us about YOUR *turning, threading and inspection problems.*

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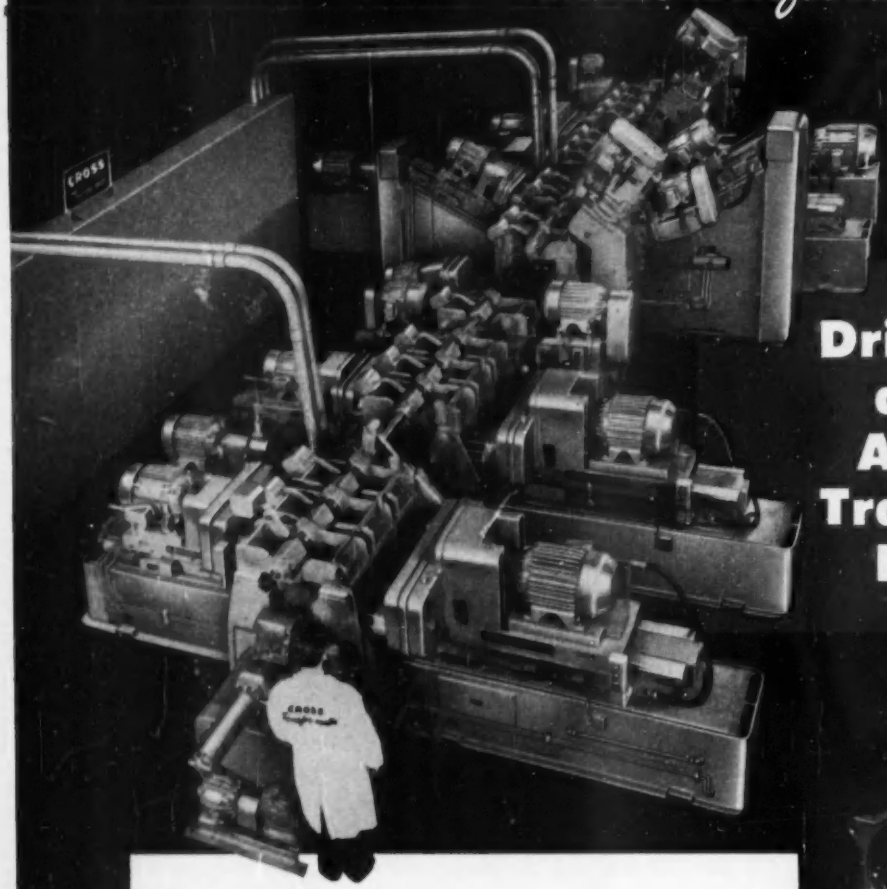
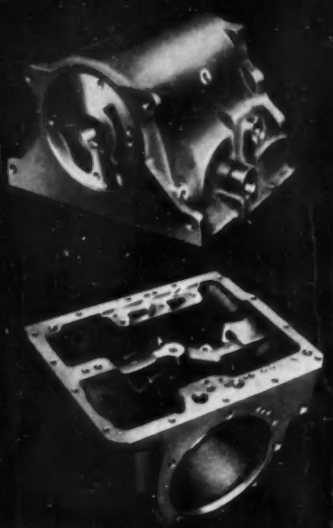
FAY LATHE DIVISION

Another Transfer-matic by Cross



Drills, Reams and Taps Automatic Transmission Housings

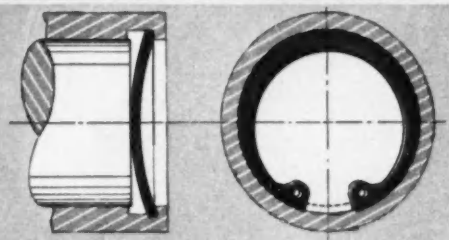


★ 29 stations.
★ 78 operations—30 drilling, 12 chamfering, 4 end milling, 3 counterboring, 14 reaming, 15 tapping.
★ 100 pieces per hour at 100% efficiency.
★ Automatic 90° indexing of part in station 14 for drilling sides and top in subsequent stations.
★ Pre-set tools and Cross Machine Control Unit with Toolometers for programming tool changes.
★ Complete interchangeability of all standard and special parts for easy maintenance.
★ Other features: Automatic transfer from station to station; hydraulic feed and rapid traverse; individual lead screw feed for tapping; hardened and ground ways; gravity operated cam clamping; J.I.C. standard construction; built-in chip conveyor.

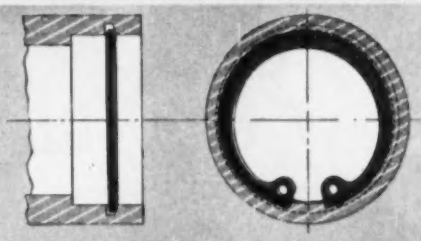
Established 1898

THE CO.
DETROIT 7, MICHIGAN
Special MACHINE TOOLS

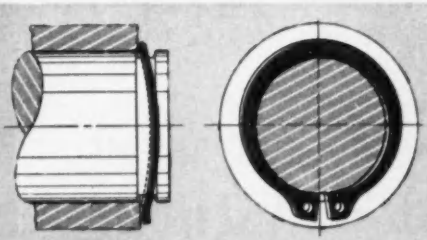
if end-play take-up is a problem
one of these special Waldes Truarc rings can solve it



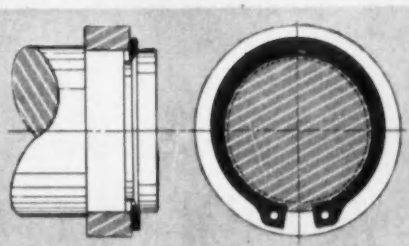
series 5001 · internal type
for bore diameters from: .250 – 1.456 in.



series 5002 · internal type
for bore diameters from: 1 – 10 in.



series 5101 · external type
for shaft diameters from: .188 – 1.438 in.



series 5102 · external type
for shaft diameters from: 1 – 10 in.

bowed WALDES TRUARC RETAINING RINGS

Take up end-play resiliently, damp vibrations and oscillations. Bent like a bow out of plane at horizontal center line. The bowed Truarc ring acts in axial direction like a floating spring without losing its tight grip against the bottom of the groove.

Maximum resilient end-play take-up: .015" to .020" depending on size of ring.

beveled WALDES TRUARC RETAINING RINGS

Take up end-play rigidly. When the ring is contracted (or expanded), the tapered edge acts like a wedge moving deeper into the groove and shifting in an axial direction until the ring abuts the machine part.

Maximum end-play take-up, depending on ring size: internal types, .005" to .043"; external types, .005" to .040".

WALDES TRUARC is much more than a better way to hold parts together

Thousands of manufacturers have already found that Truarc Retaining Rings cut production costs and speed assembly by simplifying product design. But that's not all.

Waldes Truarc engineers have extended the use of retaining rings by developing rings that perform *additional functions* while acting as retaining shoulders. Those shown here take up end-play, compensate for wear and varying manufacturing tolerances.

No matter what *your* problem, there's a Waldes Truarc Ring designed specifically to solve it. Send us your drawings, your questions—Waldes Truarc engineers will work with you, at no obligation.

SEND FOR NEW CATALOG

WALDES
TRUARC
REG. U. S. PAT. OFF.
RETAINING RINGS

WALDES KOHINOOR, INC., LONG ISLAND CITY 1, NEW YORK

WALDES TRUARC RETAINING RINGS AND PLIERS ARE PROTECTED BY ONE OR MORE OF THE FOLLOWING U. S. PATENTS: 2,382,947; 2,382,948; 2,410,055; 2,420,521; 2,430,341; 2,439,788; 2,441,049; 2,455,165; 2,483,399; 2,483,393; 2,487,892; 2,487,893; 2,491,308; 2,500,091 AND OTHER PATENTS PENDING.

Waldes Kohinoor, Inc., 47-16 Austel Place, L. I. C. 1, N. Y.

Please send me the new Waldes Truarc Retaining Ring catalog. AY 816

(Please print)

Name.....

Title.....

Company.....

Business Address.....

City..... Zone.... State.....

PARTS LIKE THESE

are produced better . . . at lower cost *by* ALLIED'S COLD FORGING METHODS

Shown at the right in actual size is one of the many cold forged parts being produced by Allied.

By no other method could this particular part, or any of the other parts illustrated above, be manufactured as economically as by cold forging. However, to produce such parts requires ingenious engineering and production methods . . . and it is at Allied where you will find the best examples of cold forging ingenuity at work.

If you have need for parts similar to these . . . if you require tolerances as close as may be required for most machined parts . . . if you want maximum strength and durability in the parts produced . . . it will pay you to investigate what Allied can do for you. Send your part prints for quotation.

Other Allied Products

HARDENED AND PRECISION GROUND PARTS
SHEET METAL DIES PRODUCED IN IRON, ALLITE (ZINC ALLOY) AND PLASTIC • R-B INTERCHANGEABLE PUNCHES AND DIES

STANDARD HEXAGON HEAD CAP SCREWS

Also produced by Allied are standard hexagon head cap screws. They are of uniformly high quality and are priced competitively. Your inquiry will receive prompt attention.

PRECISION • EXPERIENCE • DEPENDABILITY
ALLIED CORPORATION PRODUCTS

ALLIED PRODUCTS CORPORATION

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Detroit, Mich.

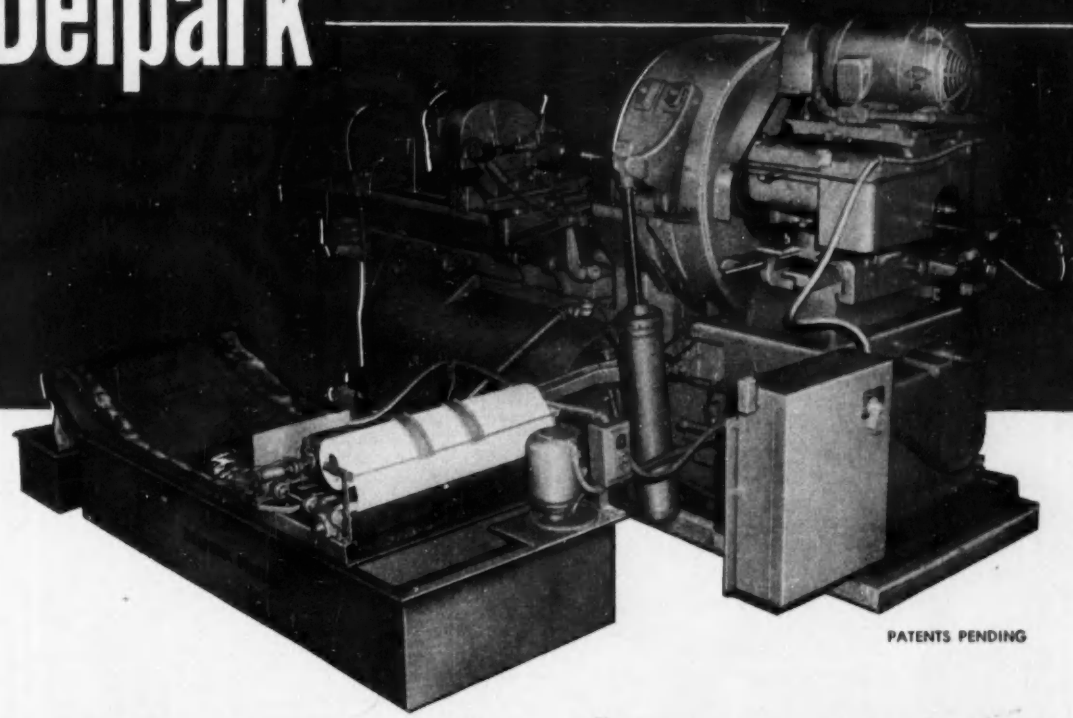
PLANT 2
Detroit, Mich.

PLANT 3
Hillsdale, Mich.

PLANT 4
Hillsdale, Mich.

"Carefree and Inexpensive Operation"

Delpark



PATENTS PENDING

The DELPARK Story runs true to form at *Willys Motors, Inc.* Here, where a number of DELPARK Filters are in service 16 hours a day, they operate with little attention at a minimum of cost.

Willys Motors says, "We never have to change the coolant, or clean the tank, excepting perhaps on a six month basis, to remove contaminants from floor sweepings. Time spent in cleaning tanks with conventional equipment would many times pay for the filter equipment."

There is one other point to remember: that DELPARK Filters make possible the full capabilities of fine precision grinders which otherwise would be impossible. Greater machine efficiency and fewer rejects add even more to the enormous savings made possible with DELPARK Filters.

DELPARK engineers are ready to help you with your specific problems. *Write today for more complete information.*

Delpark INDUSTRIAL FILTRATION

Backed by more than 30 years experience in Industrial Filtration
INDUSTRIAL FILTRATION COMPANY . LEBANON, INDIANA

INDUSTRIAL FILTRATION COMPANY
19 Industrial Avenue, Lebanon, Indiana

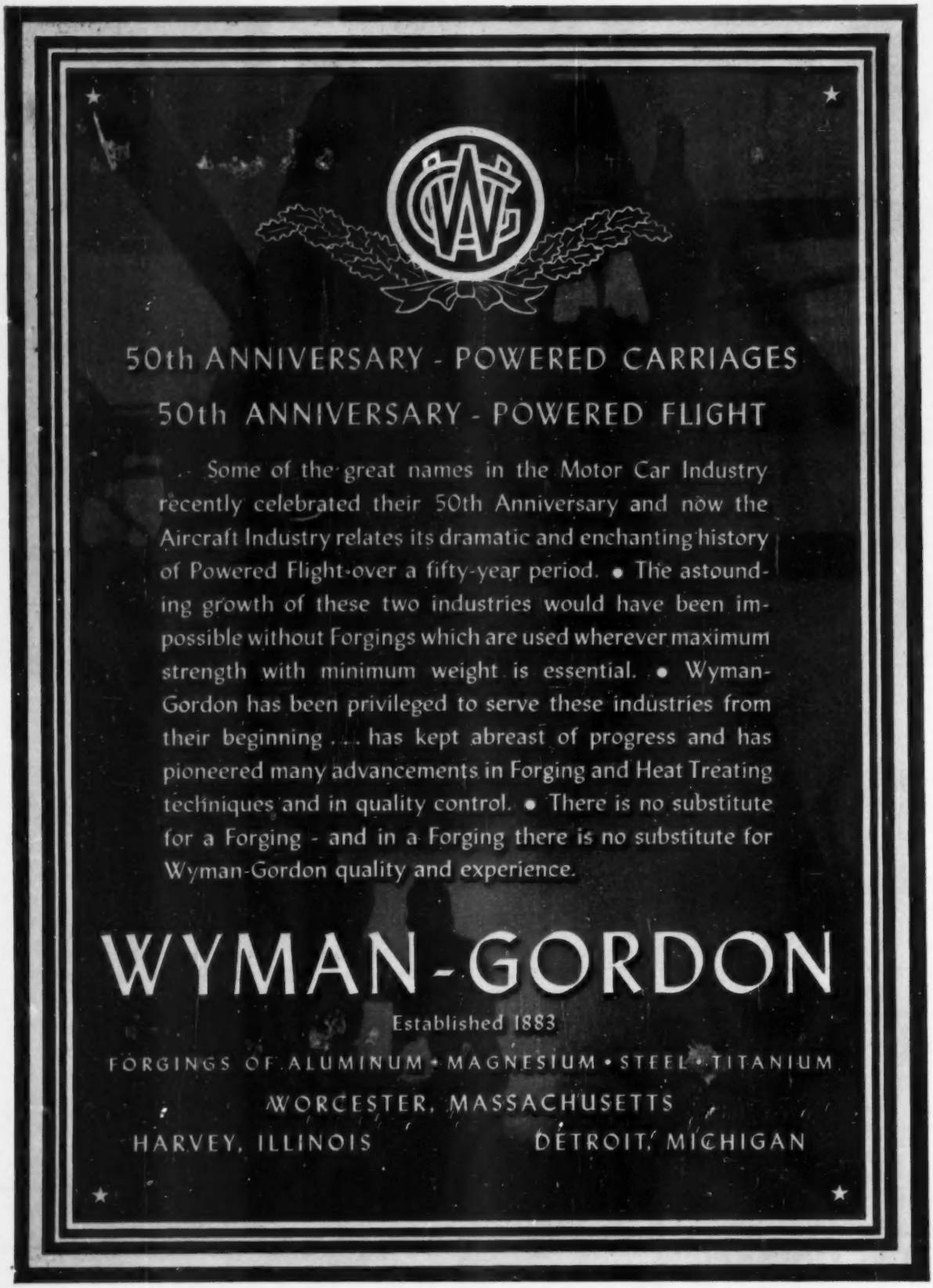
Gentlemen: We would like more information on DELPARK Industrial Filters applied to coolants.

Name_____ Title_____

Company_____

Address_____

City_____ State_____



50th ANNIVERSARY - POWERED CARRIAGES

50th ANNIVERSARY - POWERED FLIGHT

... Some of the great names in the Motor Car Industry recently celebrated their 50th Anniversary and now the Aircraft Industry relates its dramatic and enchanting history of Powered Flight-over a fifty-year period. • The astounding growth of these two industries would have been impossible without Forgings which are used wherever maximum strength with minimum weight is essential. • Wyman-Gordon has been privileged to serve these industries from their beginning .... has kept abreast of progress and has pioneered many advancements in Forging and Heat Treating techniques and in quality control. • There is no substitute for a Forging - and in a Forging there is no substitute for Wyman-Gordon quality and experience.

WYMAN-GORDON

Established 1883

FORGINGS OF ALUMINUM • MAGNESIUM • STEEL • TITANIUM

WORCESTER, MASSACHUSETTS

HARVEY, ILLINOIS DETROIT, MICHIGAN

insure faster starting... peak engine operation without lengthy warm-up!

South Wind's

Model 939-A24

COOLANT HEATER

delivers 15,000 btu/hr. to coolant!

Here is a coolant heater that gives you all the advantages of "inside-out" heating, that offers rapid engine and battery warm-up, that will maintain normal engine temperature on a moving vehicle. These functions insure faster starts, less engine wear, and longer battery life. Here is a coolant heater that is:

COMPACT—approximately 6 inches in diameter, and 15¼ inches long.

POWERFUL—delivers 15,000 BTU/hr. to coolant, with approximately 6,000 BTU/hr. of hot air available for other uses.

SIMPLE—coolant intake and outlet on heater connect directly to cooling system. Coolant may be circulated either by thermo-syphon action, or by electric water pump.

JUST CHECK THESE MAJOR FEATURES!

1. Will maintain a specified coolant temperature by cycling automatically between high and low heat.
2. Can provide intermittent or constant heat to battery.
3. Will operate satisfactorily on a moving vehicle.
4. Will withstand exhaust restriction equivalent to more than 125 feet of 1½ inch exhaust pipe.
5. May be mounted horizontally or vertically.
6. Easy installation as a result of package design incorporating self-contained fuel valve, cycling switch, and overheat switch.
7. Specially designed combustion chamber to prevent formation of carbon on water jacket walls.
8. Combustion blower fan powered by reliable ball bearing motor.
9. Unit radio suppressed to latest requirements of MIL-S-10379.
10. Unique design allows for low production cost.
11. Service parts interchangeable with those of South Wind Model 978 personnel heater.

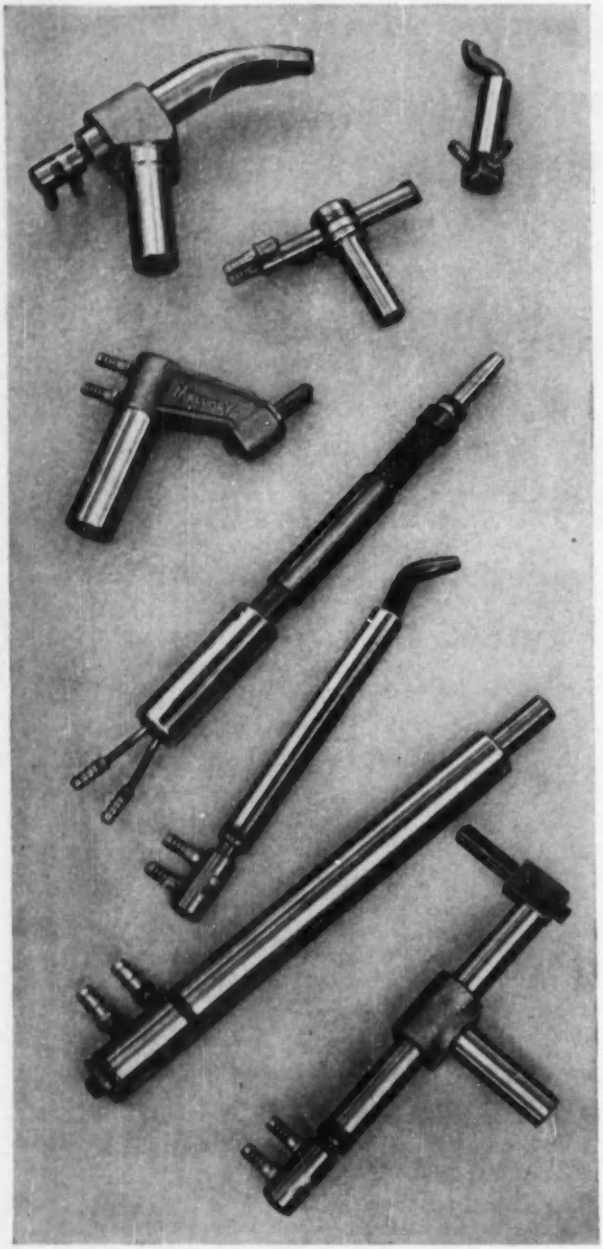
Do You Have a Heating Problem? Write today for the experienced counsel of South Wind field engineers about *any* problem in pre-heating. The wide range of South Wind Heaters includes 15,000 – 20,000 – 30,000 – 50,000 – 60,000 – 100,000 – 200,000 – 600,000 – and 700,000 BTU/hr. capacities. Write South Wind Division, Stewart-Warner Corporation, Indianapolis 7, Indiana.

A PRODUCT OF SW STEWART WARNER

South Wind

PERSONNEL HEATING
ENGINE AND EQUIPMENT PRE-HEATING
WINDSHIELD DEFROSTING

No Job is a "Special"...



with Mallory Resistance Welding Holders and Electrodes

Welding pressures from under 100 pounds to over 6000 pounds can be handled by standard Mallory holders and electrodes . . . available from stock.

In addition, holders and electrodes are available in such a wide variety of shapes and designs that standard units can be combined in an almost infinite number of combinations. Practically any resistance welding job can be done without the cost or delay of special designs.

The Mallory line is the result of over 25 years of experience in the development of special alloys and a complete range of designs. Write us, or ask your distributor, for the new Mallory Catalog. See for yourself the complete line of holders, electrodes, rods & bars, dies, castings, forgings, and accessories that are on the shelf for immediate delivery.

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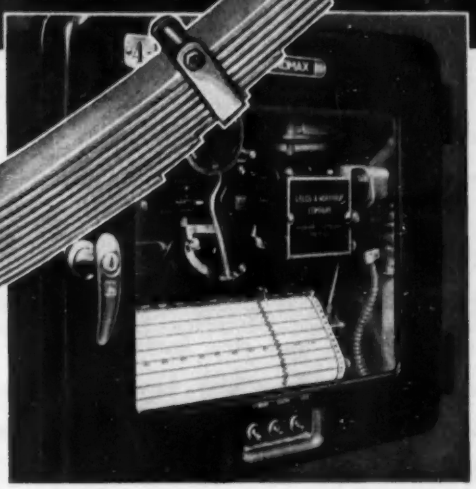
GREATER DEPENDABILITY . . . a Basic Characteristic . . .

of

DSP



. . . is established by exacting temperature control during manufacture

In the production of DSP Leaf Springs, centrally located heat controls automatically maintain accurate and constant temperatures during the quench-forming and drawing operations. These pyrometer controls, on each of our various furnaces, limit temperature variances to plus or minus 10°.

Instruments, such as the above, have played an important part in the manufacture of DSP Leaf Springs since 1904. They are part of a production pattern which gives you springs of "GREATER DEPENDABILITY" . . . another reason why *the makers of most of America's trucks use DSP Leaf Springs as original equipment.*

SINCE 1904 — ORIGINAL EQUIPMENT ON CARS, TRUCKS, CABS, BUSES, TRAILERS.

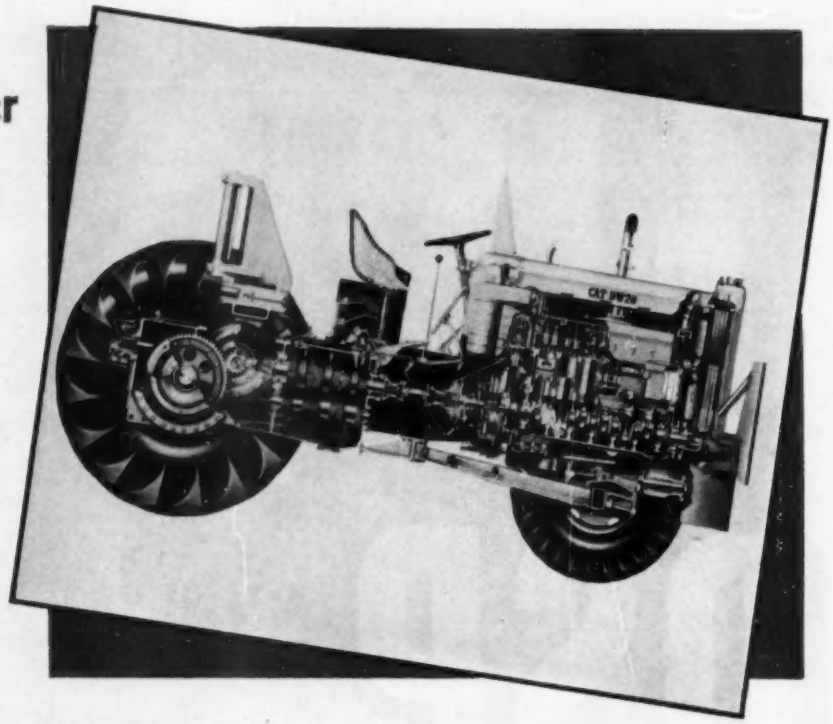
Automotive Division

DETROIT STEEL PRODUCTS COMPANY

Also makers of *Fenestra* Building Products

2250 E. Grand Blvd., Detroit 11, Michigan

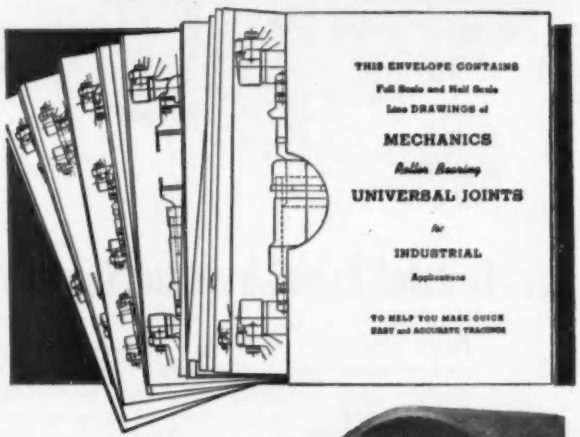
Now More Than Ever SALES Begin on the Drawing Board

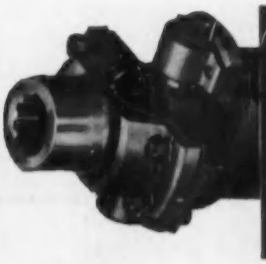


AN EXAMPLE of how competent engineering gives competitive advantages to a product is shown in this cut-away drawing of a Caterpillar DW20 Tractor. Note that every component in the design is well suited to the needs of the complete product. Among the sales-stimulating features of this tractor is the use of the right type and size universal joints. Let our engineers show you how the exclusive weight, size, service and safety advantages of MECHANICS Roller Bearing UNIVERSAL JOINTS will add to the sales appeal of *your* product. The engineering kit, shown at the right, will be sent to product designers, upon request.

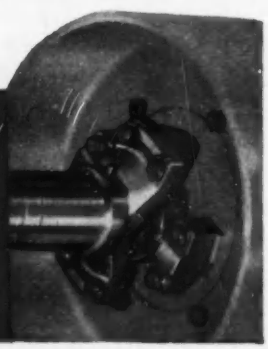
MECHANICS UNIVERSAL JOINT DIVISION
Borg-Warner • 2024 Harrison Avenue, Rockford, Illinois

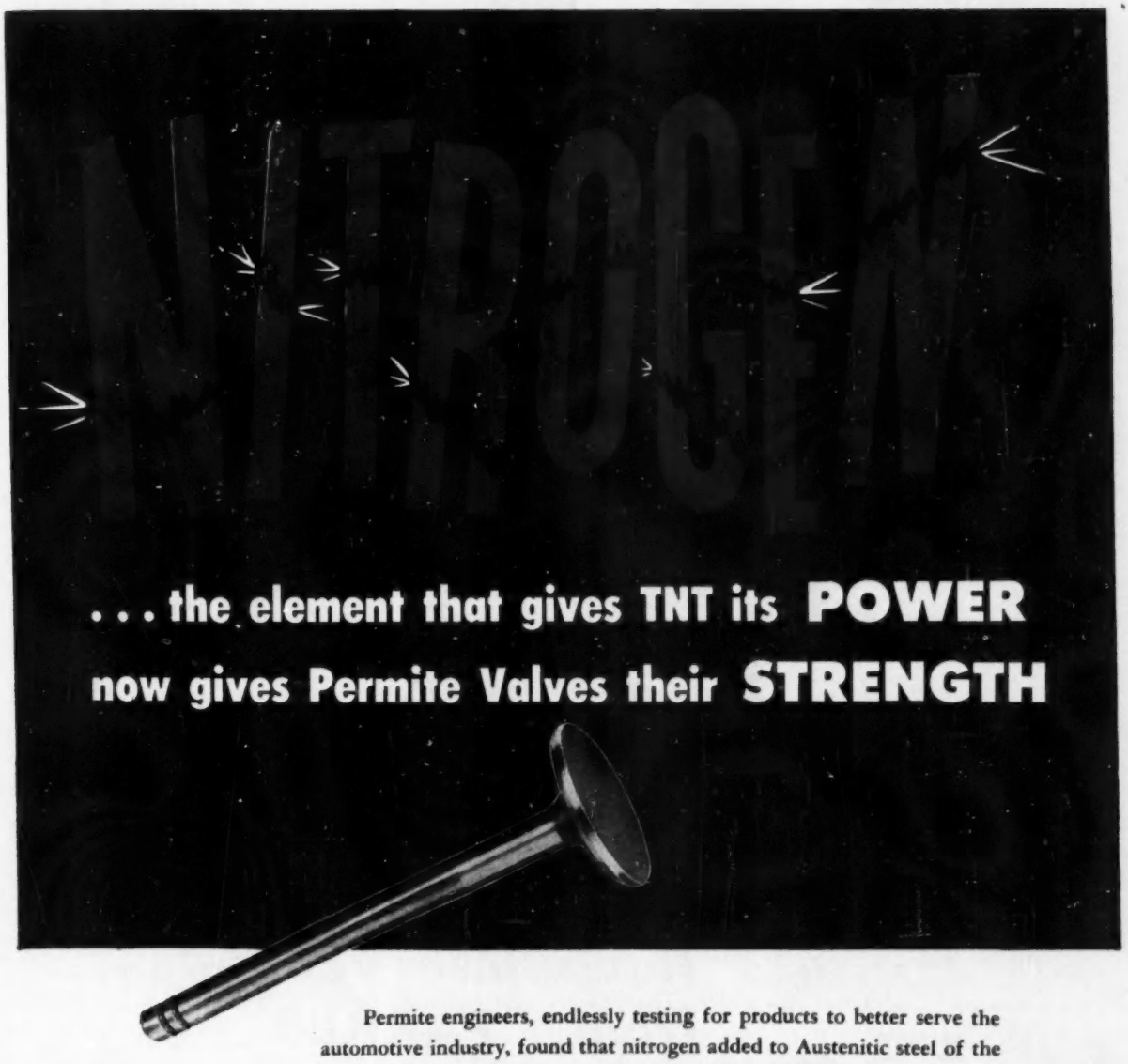
GET THIS HANDY UNIVERSAL JOINT ENGINEERING KIT





MECHANICS
Roller Bearing BW
UNIVERSAL JOINTS
For Cars • Trucks • Tractors • Farm Implements • Road Machinery • Aircraft • Tanks • Busses and Industrial Equipment





Permite engineers, endlessly testing for products to better serve the automotive industry, found that nitrogen added to Austenitic steel of the 21-chrome type definitely increases the ability of this alloy to resist heat and corrosion. Nitrogen increases the valve's strength at least 25% and its hardness 40% when operating at elevated temperatures.

Permite exhaust valves with nitrogen added, the valves that are used in many of today's leading automotive engines, are typical of Permite's contribution to automotive progress.

For over 30 years, Permite engineers have cooperated with automotive and industrial engine builders in developing valves, pistons and other parts to promote better engine performance. We invite consultation on your requirements.

PERMITE

ALUMINUM INDUSTRIES, Inc. . . . Cincinnati 25, Ohio

Detroit: 809 New Center Building New York: 9 Rockefeller Plaza
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ALUMINUM PERMANENT MOLD AND SAND CASTINGS . . . HARDENED, GROUND AND FORGED STEEL PARTS

120 YEARS OF KNOW-HOW

from all over the world flows into your plant from PARKER

Parker Rust Proof Company, U. S. — **38** years

Metallgesellschaft, A. G., Germany — **26** years

The Pyrene Company, England — **28** years

Societe Continentale Parker, France — **28** years

120 years

Our customers, through our international affiliations, get the benefits of world-wide research, experiment and application.

For the best in surface treatments for metals, call on Parker!

**Bonderite, Bonderlube, Parco, Parco Lubrite — Reg. U.S. Pat. Off.*

Since 1915— leader in the field

PARKER RUST PROOF COMPANY

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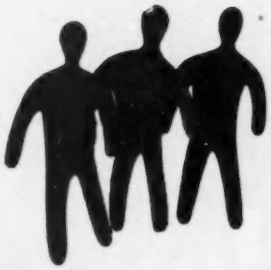
BONDERITE corrosion resistant paint base

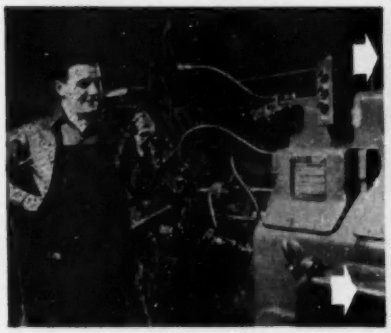
BONDERITE and BONDERLUBE aids in cold forming of metals

PARCO COMPOUND rust resistant

PARCO LUBRITE wear resistant for friction surfaces



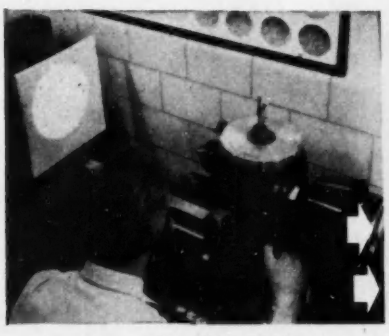
HERE'S WHAT HAPPENS WHEN REPUBLIC'S 3-D METALLURGICAL SERVICE GOES INTO ACTION



The field metallurgist comes right into your plant. He checks furnace temperatures and heating cycles, machines, set-ups, feeds, speeds, everything which affects your production.

He talks to your plant and engineering people, asks questions, finds out what you want your alloy steels to do. He takes this data with him.

The Republic Field Metallurgist talks over his report with Republic's Mill Metallurgist. Experienced in producing alloy steels, he adds his knowledge, checks it against your problem. And since Republic controls its alloy steels from ore to finished product, he can trace heats of steel.



The field metallurgist next talks things over with the Republic Laboratory Metallurgist. His data on tests of alloy steels is added to the material of the field and mill metallurgist.

Then, all three men put their heads together and come up with a recommendation that is the result of pooling their findings and their experience with alloy steels. And since Republic pioneered the manufacture of alloy steels, this recommendation is based on solid data.

The Republic Field Metallurgist passes this recommendation on to your engineers and plant personnel. He works with them to see that your problem is solved satisfactorily, right in your plant. It's his job to see that you get all the advantages out of the alloy steels you use.

The results often include lower production costs, better quality, or even changes in design. You can have this free service by calling your local Republic Steel sales office.

REPUBLIC STEEL

ALLOY STEELS

REPUBLIC STEEL CORPORATION
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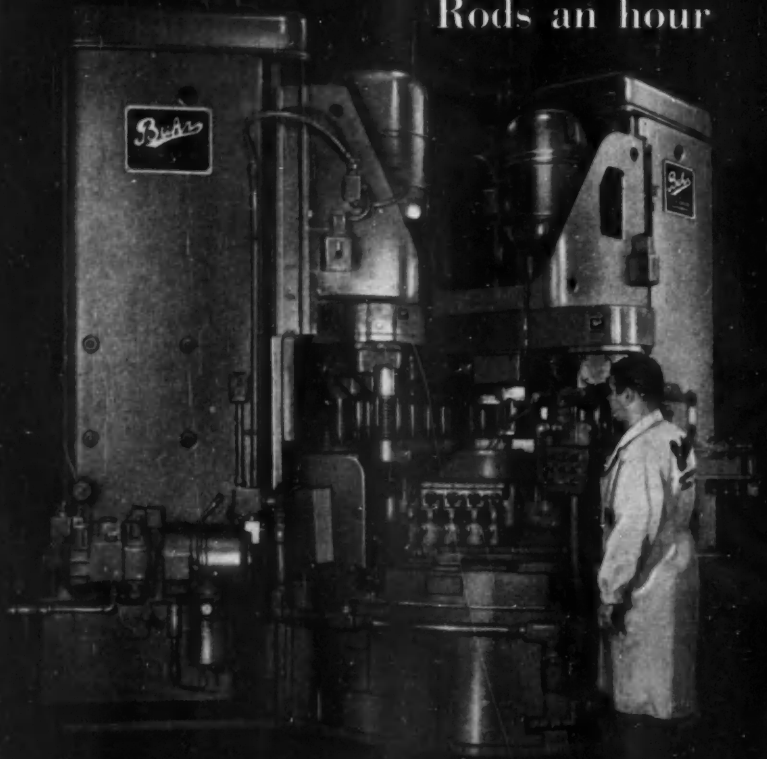
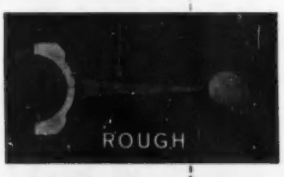
Other Republic Products include Carbon and Stainless Steels—Sheets, Strip, Plates, Pipe, Bars, Wire, Pig Iron, Bolts and Nuts, Tubing.

Buhr SPECIAL...

Drills, reams and chamfers 565 Connecting Rods an hour



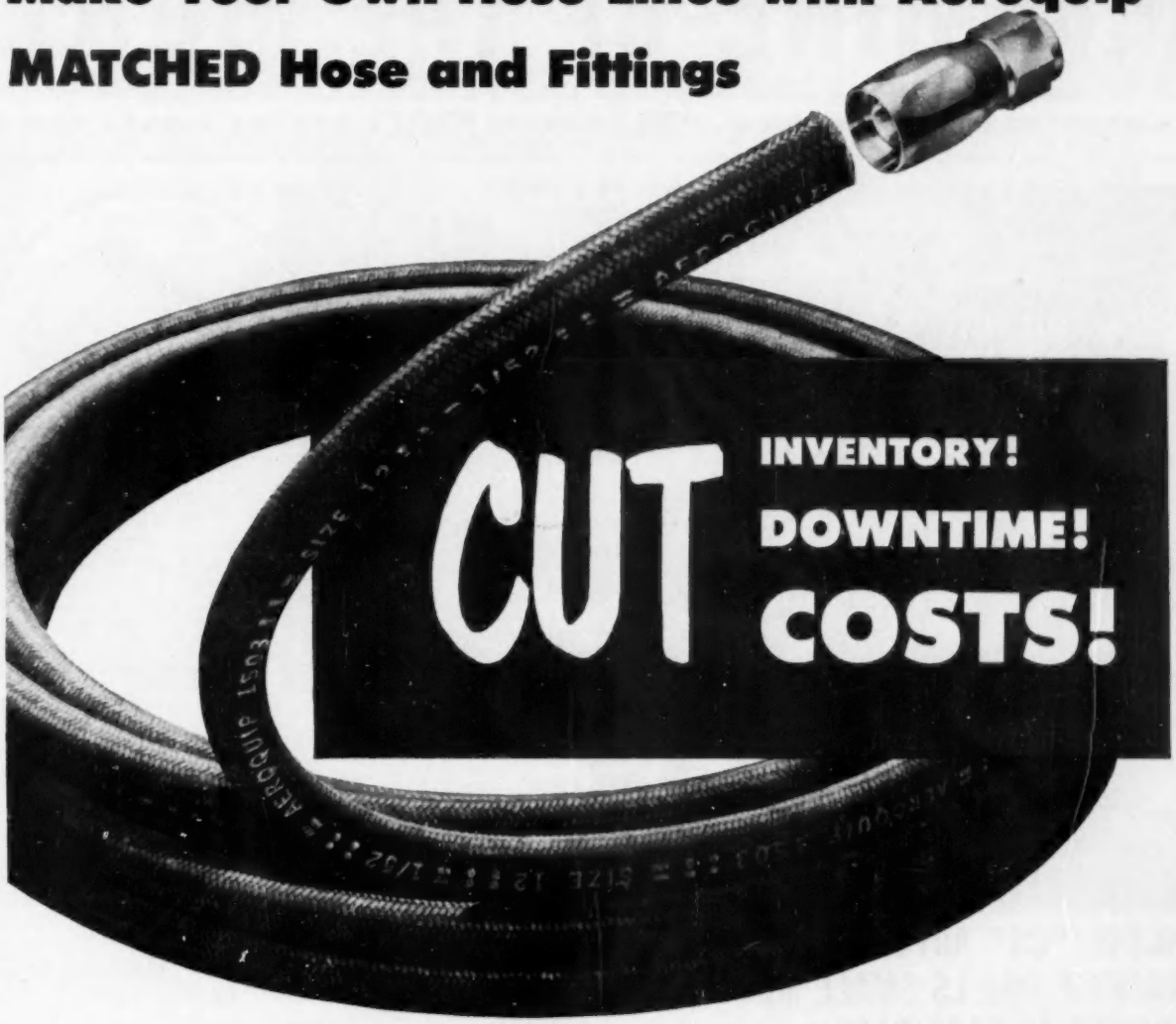
This Two-Column Automatic Drilling Machine
is arranged with tool-steel, laminated, hardened and ground ways.
Heavy-duty ball-bearing construction provided for all spindles.
The eight-station holding fixture is mounted
on 60"-diameter automatic Index Table.
Parts are manually loaded, hydraulically clamped and automatically ejected.
All installations comply with J.I.C. Standards.
Automatic lubrication throughout Machine.
Special safety features . . . Only one operator required.



BUHR MACHINE TOOL CO.
ANN ARBOR, MICHIGAN

Buhr **MULTIPLE-SPINDLE HIGH PRODUCTION MACHINERY**

Make Your Own Hose Lines with Aeroquip MATCHED Hose and Fittings



Aeroquip Fittings are designed, developed, and produced to go with Aeroquip Hose. They form such a foolproof combination that Aeroquip *guarantees* performance. Thus, the hose lines made right in your own plant always measure up to Aeroquip's exacting standards of quality, the highest in the industry. A small supply of Aeroquip Bulk Hose and Fittings assures you of quick hose line replacements at all times . . . and Aeroquip Fittings are detachable and may be used again and again when making new hose assemblies.

Aeroquip

REG. TRADE MARK

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SALES OFFICES: Burbank, Calif. • Dayton, Ohio • Hagerstown, Md. • High Point, N. C. • Miami Springs, Fla. • Minneapolis, Minn. • Portland, Ore. • Wichita, Kan.

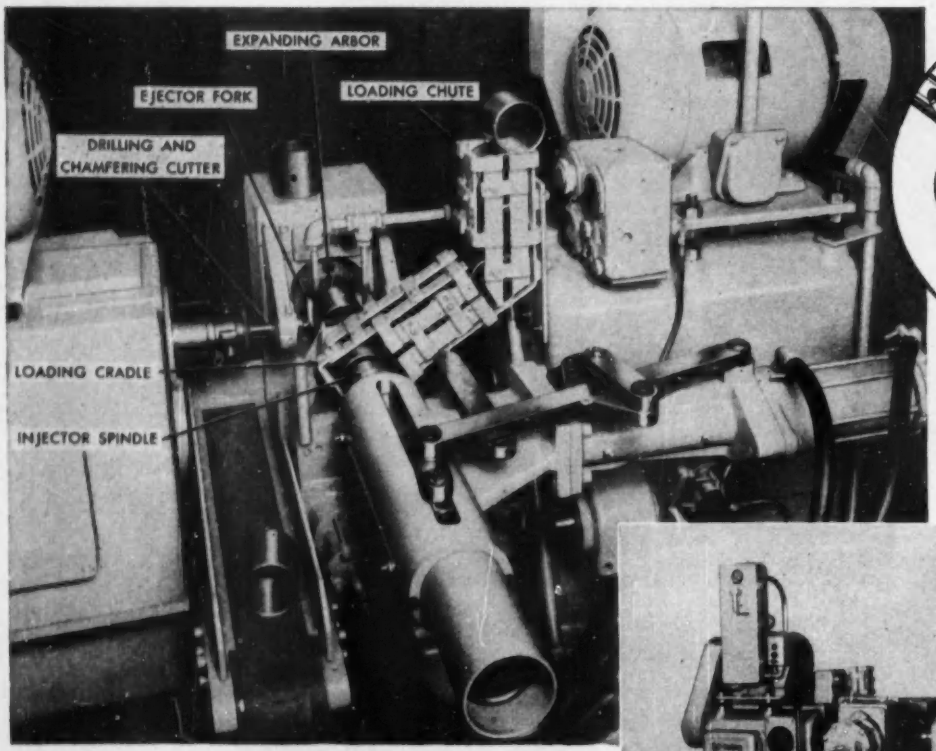
IN CANADA: Prenco Progress and Engineering Corporation Ltd., Toronto

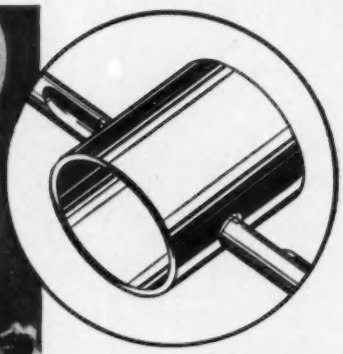
IN ENGLAND: Super Oil Seals & Gaskets, Ltd., Birmingham

AEROQUIP PRODUCTS ARE FULLY PROTECTED BY PATENTS IN U.S.A. AND ABROAD

MACHINE OF THE MONTH

PREPARED BY THE SENECA FALLS MACHINE CO. "THE Lo-swing PEOPLE" SENECA FALLS, NEW YORK

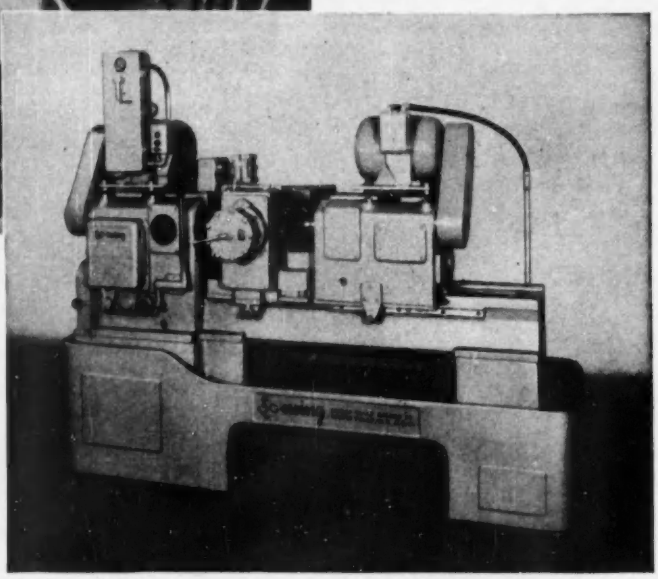




▲ *Schematic diagram showing application of two combination Drilling and Chamfering Cutters to work.*

◀ *Closeup rear view of machine with safety cover removed to show automatic loading mechanism.*

▼ *Overall front view of machine.*



MODEL "CS" AUTOMATIC DRILLING MACHINE DRILLS SMALL MOTOR FRAMES AT FAST PACE

Problem: **To automatically load, drill and chamfer two holes at 180° and automatically eject small motor frames.**

Solution: **The Model "CS" Automatic Drilling Machine selected for this job was equipped with two Drilling Heads and a combination holding, loading and ejection mechanism shown in upper illustration.**

In operation, the frames, which have been faced to length in a previous operation, are placed in the loading chute and fed by gravity to the loading cradle where they are picked up by the injector spindle and placed on an air-operated expanding arbor. The injector then retracts to clear the work and the two combination drilling and chamfering cutters advance in rapid traverse to the work piece; then slow down for the length of cutting stroke and finally return in rapid traverse to the starting position. The finished piece is automatically ejected by the ejector fork and falls on a moving conveyor which carries it to a tote box, and at the same time keeps the machine clear of chips.

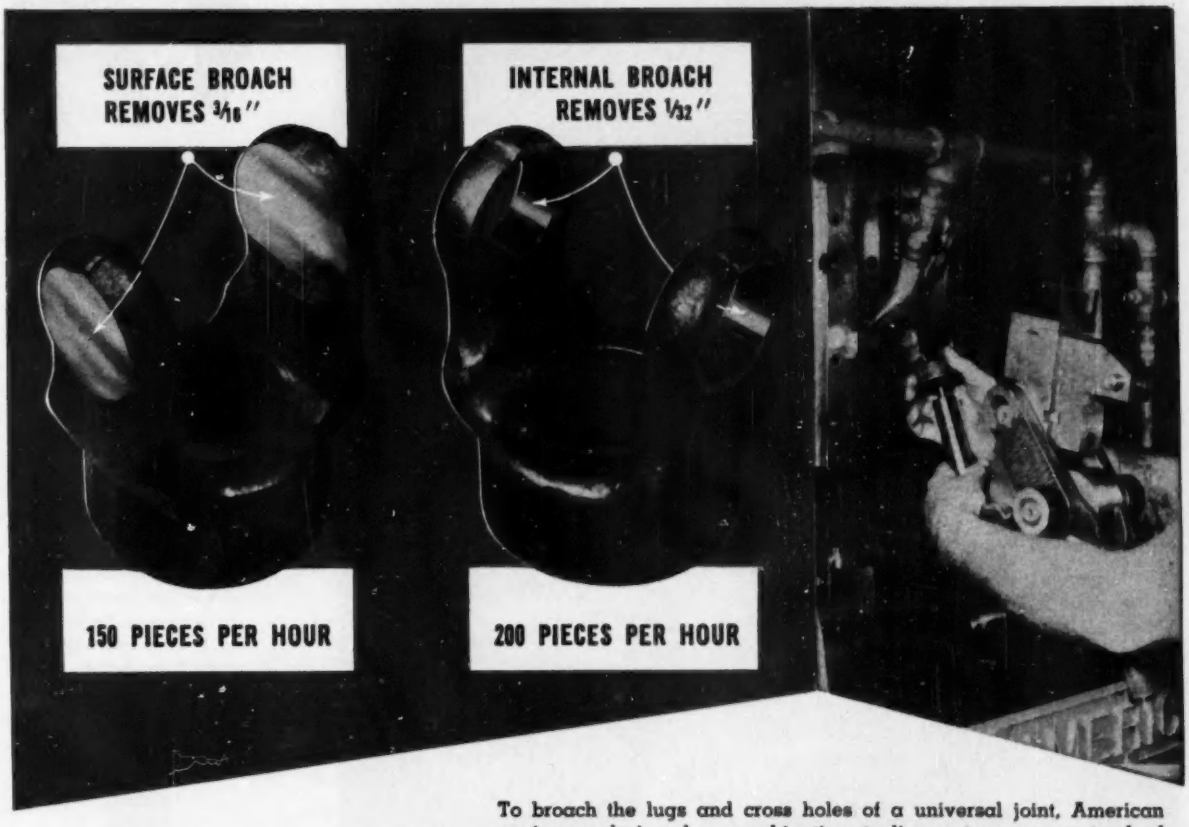
The entire operation is automatic and controlled by cams mounted on a camshaft which synchronizes all machine and loader movements. The loading and unloading takes place during a short dwell milled in the drilling head cams. The operator simply loads the parts in the loading chute, the machine takes over from this point. Production is 600 pieces per hour at 100% efficiency.

Consult Lo-swing engineers about *your* machining problems.

SENECA FALLS MACHINE CO., SENECA FALLS, N. Y.

PRODUCTION COSTS ARE LOWER WITH Lo-swing

one American broaching machine



surface and internal broaching possible with American 3-way machine

To broach the lugs and cross holes of a universal joint, American engineers designed a combination tooling set-up on a standard American T-10-36 3-way machine.

Arranged with 3 stations, the machine surface broaches 3/16 stock off the inside and outside surfaces of the lugs at the center station; or broaches 1/32 off the I. D. of the lug cross holes at the two outer stations. The versatility of the American 3-way machine allows for a permanent tooling set-up, to handle both operations.

Such assistance in planning and setting up your broaching operation is part and parcel of the American Way of broach engineering. It is a typical example of the complete service you get from American Broach . . . the organization that makes all three . . . broaches, machines, and fixtures.

For more information on your particular broaching problem send a part-print or sample and hourly requirements. Address Dept. I.

For more information on American Machines send for Catalog #300.

AMERICAN American BROACH & MACHINE CO.
A DIVISION OF SUNDSTRAND MACHINE TOOL CO.
American Building - Ann Arbor, Michigan
See American First — for the Best in Broaching Tools, Broaching Machines, Special Machinery

SUNDSTRAND

Four UNBRAKO Socket Head Cap Screws speed assembly in the plant, and reassembly in the field, of these flow-control valves providing 16 different inlet-outlet flow direction combinations.

The knurling on the head of the screw permits faster assembly, because it provides a slip-proof grip.

The uniform depth and size of the hex socket assure maximum torque in wrenching. The accurate diameter of the head permits countersinking.

UNBRAKOs—made of heat treated alloy steel—have fully formed threads, Class 3 fit; controlled fillet and continuous grain flow for strength. Supplied in standard sizes from #4 to 1".

Get personalized service, faster delivery with UNBRAKO Standards—stocked by your distributor

When you use UNBRAKO socket screw products, you get the finest socket screws made, *plus* the personalized service and the faster delivery of your local distributor. And he enables you to cut your inventory, set up more space for production. For more information, write for UNBRAKO Standards—a complete listing of precision socket screw products carried by your distributor. STANDARD PRESSED STEEL Co., Jenkintown 53, Pa.

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Your problem interests us. We'd like to work with you on the engine controls you need . . . carburetor choking, constant speed control, overspeed protection, overspeed safety cut-off, fuel regulation or related requirements. Tell us your specific problem . . . we'll send a qualified engineer.

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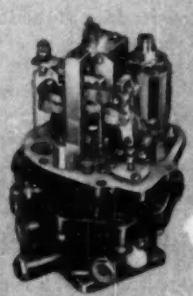
Sisson Chokes . . .
Automatic and Electrimatic carburetor chokes as original equipment or replacement
19 million chokes in the past 17 years!



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Bendix Low Pedal Power Brake

one of the most popular new car features in years

Specified by More Car Manufacturers Than Any Other Make

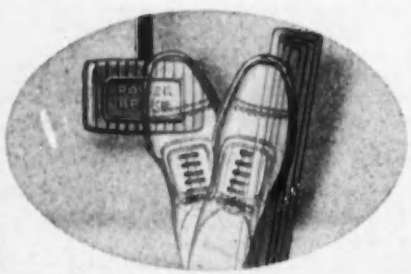
Since the earliest days of the industry, car manufacturers have entered each model year with a host of new improvements that represent added value for the motoring public.

While all of these advancements have contributed to greater motoring enjoyment, the "new car features" that have basically altered previous motor car standards of performance are relatively few in number. For example, four-wheel brakes, a Bendix development, brought new safety to the highways; automatic transmissions materially increased driving ease; and today another great new feature, Bendix* Low Pedal Power Brake, is recognized as a revolutionary advancement in motor car control.

It is the only low pedal power brake that has met the test of millions of miles. In fact, Bendix Low Pedal Power Brake is specified by more manufacturers than any other make. It is the product of Bendix—world's largest producer of power brakes and leader in braking developments since the earliest days of the industry.

To make your line more popular it pays to equip with the performance proven Bendix Low Pedal Power Brake. *REG. U.S. PAT. OFF.

NOW *Stopping* IS AS EASY AS *accelerating*



It is no longer necessary to lift the foot and exert leg power pressure to bring your car to a stop. With the Bendix Low Pedal Power Brake on about the same level as the accelerator, an easy ankle movement, much like working the accelerator, is all the physical effort required for braking. And by merely pivoting the foot on the heel, shifts from "go" to "stop" controls are made in far less time.

Result! **MORE DRIVING COMFORT, LESS FATIGUE AND GREATER SAFETY**

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High Spots of This Issue

★ **Heavy Press Program Among Features at ASME Meeting**
The presentation of over 300 technical papers and 126 technical sessions served to make the recent ASME meeting in New York City one of the most instructive ever held. The Air Force heavy press program rated high among the subjects discussed. Page 48.

★ **Ford Adopts Overhead Valves for Car and Truck Engines**
Behind the seven different powerplants installed in Ford cars and trucks for 1954 lies a dramatic story of how a painstaking engine program was conceived and executed. The author reviews it briefly and surveys the resulting unit in detail. Page 52.

★ **Automatic Welding Lines for Fisher Body Components**
In addition to sweeping like wildfire through the automobile manufacturing industry, automation has likewise made quite a stir among component makers. Herein is reviewed a set-up of automatic welding lines for sheet metal body parts. Page 56.

★ **The Completely New Buicks**
It is obvious that 1954 was chosen by Buick as the target year for "shooting the works" in the way of new developments throughout its line of cars. The vast array of both mechanical and styling innovations are documented in this article. See page 60.

★ **Rockets Behind the Iron Curtain**
Regardless of whatever other military refinements he may or may not lack, the Russian Bear has certainly not been hibernating as far as rocket development is concerned. The author's report on his activities gives little cause for our comfort. Page 68.

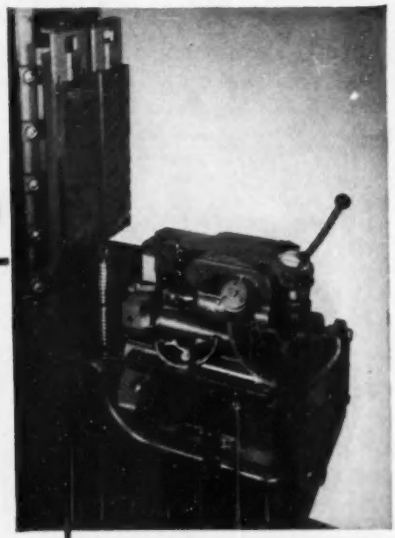
★ **33 New Product Items And Other High Spots, Such As:**
Ford cars and trucks for 1954; Packard has 212-hp engine; latest plastic trailer developments; highway expansion problems; automobile industry sets new dollar volume record; and jet engine thrust increased.

Automotive and Aviation News, Page 33
Complete Table of Contents, Page 3

Keeping the cost of BIG FAMILIES at a minimum

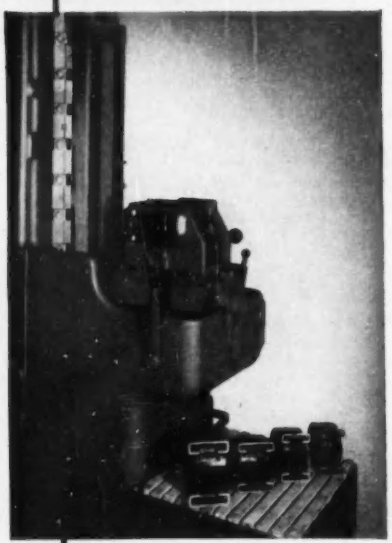
In the metalworking industry, big families of parts can eat profits out of house and home. Nevertheless, they can prove to be an asset if they're studied carefully from the viewpoint of reducing production costs. Cincinnati Application Engineers have been doing this for years with large and small quantities of similar parts that can be machined by the broaching process. Examples of their work are illustrated here. Do they suggest new ideas for your shop? ¶ Perhaps you have a high-cost family of parts —those having similar machining operations. Let us know about them. And if you would like to have more data on CINCINNATI Hydro-Broach Machines, refer to Sweet's Catalog File for Mechanical Industries, or write to us for publications M-1709-1 and M-1745.

THE CINCINNATI MILLING MACHINE CO.
CINCINNATI 9, OHIO



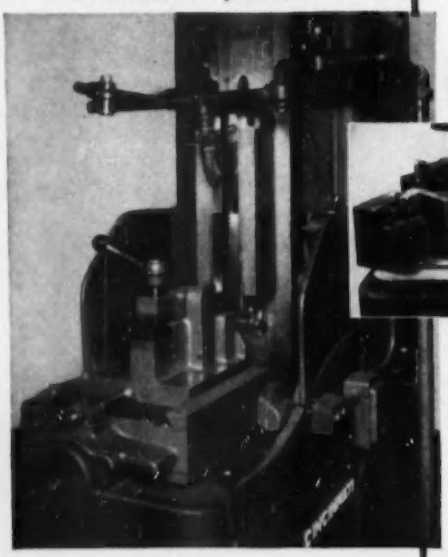
FAMILY OF 90 CAMS

Part name ..... Cams (90 sizes and shapes)
Material ..... Cast iron
Operation ..... Broach half bore and parting face
Production ..... 140 per hour
Equipment ..... CINCINNATI No. 5-54 Single Ram Vertical Hydro Broach completely equipped to broach 90 sizes and shapes of cams

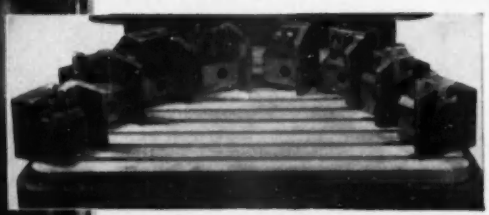


FOUR IN THIS ONE

Part name ..... Housings
Material ..... Cast iron
Operation ..... Broach feet
Production ..... 130 per hour
Equipment ..... CINCINNATI No. 5-54 Single Ram Vertical Hydro-Broach Machine, tooled up with broach inserts (cutters) and a fixture having interchangeable locating elements



EIGHT MEMBERS IN THIS FAMILY



Part name ..... Terminal studs (8 sizes and shapes)
Material ..... Copper
Operation ..... Straddle broach sides
Production ..... 125 per hour
Equipment ..... CINCINNATI No. 5-54 Single Ram Vertical Hydro-Broach Machine, tooled up with broach inserts (cutters), fixture and interchangeable fixture elements

Write for this folder—How to Step Up Production with CINCINNATI HYDRO-BROACH MACHINES — publication No. M-1599-1.

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News of the AUTOMOTIVE AND AVIATION INDUSTRIES

Vol. 110, No. 1 **January 1, 1954**

Chances Dim for Cut in Automotive Taxes

There is little hope that excise taxes on automotive products will be repealed. There is serious doubt that they even will be reduced as scheduled. Under the current law, the 10 per cent tax on passenger cars and the eight per cent levy on trucks, parts, and accessories are scheduled to be reduced to seven per cent and five per cent, respectively, April 30.

A big tax battle is brewing in Washington, and there is broad sentiment for bringing many other products under the excise tax laws. If this happens, it is considered highly unlikely that automotive excises will be changed. Industry representatives, however, will continue to press for at least a reduction next April, as called for under the law.

CBE TRUCK

Better visibility for the driver is said to be the prime advantage of this new cab-beside-engine truck announced by Kenworth Motor Truck Corp. Other features are weight-saving through use of all-aluminum welded construction, lower maintenance and repair costs, and more comfortable riding qualities. Dimensions are 70 in. long and 96 in. wide, the same as those of the present Kenworth cab-over-engine model.

Chevrolet Cuts Price of Power Steering

First of the General Motors divisions to announce reduced prices on power steering is Chevrolet. The new price is $134.50, a drop of $43.05. After Lincoln announced a cut in its power steering device, which is supplied by General Motors, it had been expected that GM divisions also would lower their prices.

Buick Trade-ins Reveal Market Penetration

Buick has revealed some interesting information on its penetration of the low-priced field with its Special series. About 45 per cent of the cars traded in on Specials are Chevrolets or Plymouths, according to A. H. Belfie, general sales manager.

The figures are particularly interesting in view of the recent prediction by W. E. Fish, Chevrolet general sales manager, that the low-priced volume lines could take an increasing share of the market next year, probably the prewar ratio of 60 per cent. The low-priced field has been accounting for about 54 per cent of the market.

Ford Denies Planning Its Own Finance Firm

Ford has refuted reports that it is planning to set up its own finance company to compete with GMAC, the General Motors financing subsidiary. Walker Williams, Ford vice-president, says with thousands of finance firms competing for the company's business Ford dealers have almost unlimited access to financing.

Packard Receptive to Merger Offer

Packard is one company that is not particularly bashful about admitting it would not mind being party to a merger. J. J. Nance, president, says there are no merger talks going on at present that involve Packard, but he would welcome a merger if it proved good for Packard.

Mr. Nance points out that Packard, due to its position as the only independent left in the high-priced field, would be an essential part of any successful merger. He added that the company is being strengthened and reorganized.

GM Motorama to Feature Gas-Turbine-Powered Car

A principal feature of the GM Motorama, opening this month in New York City, will be a gas-turbine-powered car. Details are still very confidential, but the styling, as well as the engine, is said to be very unusual.

The car is a strictly experimental one. GM has already discovered, however, that there are many serious problems to be overcome before such a car could ever become a practical vehicle.

News of the AUTOMOTIVE

Car Credit Terms May Be Modified

One result of the bitter competitive struggle expected this year may be some easing of credit terms on installment buying of automobiles. There are some indications that large finance companies may ease their terms somewhat as a sales stimulant under pressure from some of the large automobile manufacturers.

No general breakdown in credit standards is expected. There is, however, considerable belief that room exists for some liberalization of terms.

Dealers Incite Probe of Car Manufacturers

Automobile manufacturers may become the target of legislative committees in respect to new car dealer stocks. Two developments probably mark only the start of many that will result from dealer pressure which has been building up since automobiles have become more difficult to sell.

Senator Douglas of Illinois states he has requested the Senate Committee On Small Business to investigate dealer charges that manufacturers have forced large stocks of cars on them in the face of a declining market. A Missouri dealers' group sent a copy of a resolution condemning factory practices to the Justice Dept., which has asked for names of individual dealers who could be interviewed for evidence by agents of the anti-trust division.

Strained relations between factory and dealers were to be expected after several lush years when dealers made high profits without any particular effort on their part because of the car shortage following the war. The sudden transition to the hard realities of competitive selling has found many dealers unprepared, and it is quite natural that they should resist taking any more cars into their inventories than they can sell at full discount.

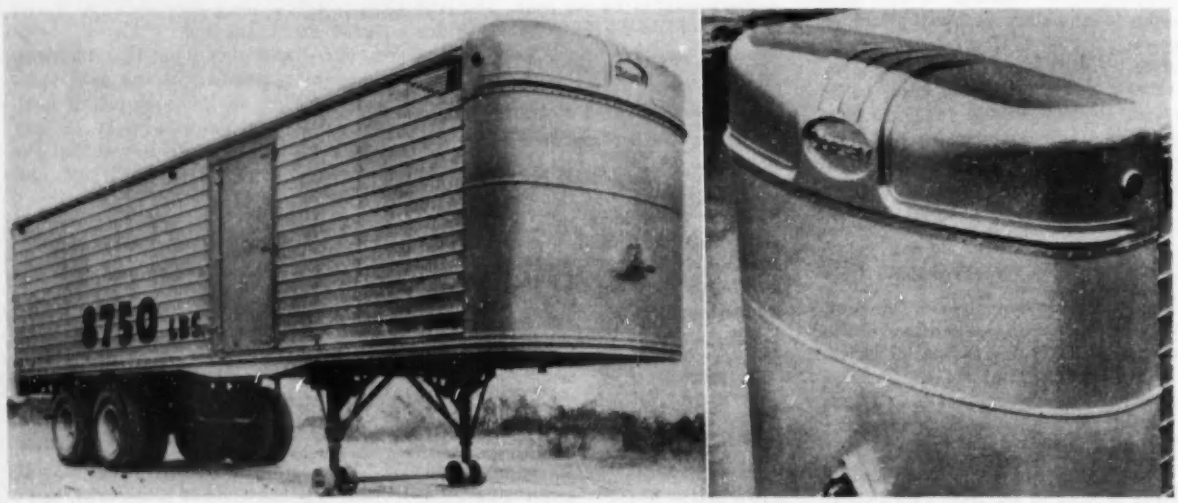
Many experienced dealers, however, are fully aware that the current situation is not a new one, since it existed in all normal periods before the war. Factory dealer friction certainly will prevail in 1954, but industry observers are highly doubtful that legislative investigations will accomplish any useful purpose. In fact, there is some opinion that dealers themselves might stand to lose more than they would gain by any attempted corrective legislation.

Station Wagons Make Large Market Gain

One of the most outstanding features of the 1953 automobile year was the big gain made in station wagons. An all-time high of 290,000 station wagons was built last year, an amazing 62 per cent more than in the previous high year, 1951.

Although the station wagon first appeared on the automobile scene in the early 1920's, it never accounted for any appreciable percentage of production until after World War II. In 1936 production amounted to a little less than 7400 vehicles and, in 1940, still totaled less than one per cent of total passenger car production. However, it started to gain popularity after the war, climbing to 2.1 per cent in 1948, 3.4 per cent in 1952, and currently accounts for nearly five per cent of passenger car output.

Manufacturers are not sure just what accounts for the popularity of the station wagons but think that suburban living has been an accelerating factor. Likewise, higher quality and more flexible designs for use as combination passenger and utility vehicles undoubtedly have done much to heighten their popularity.



PLASTIC ROOF CAP ON NEW DORSEY MODEL

Star model in the new line of Dorsey trailers is the 32-ft tandem dry freight van that weighs only 8750 lb. A combination of stressed sheet sides and steel X-bracing is said to give the vehicle greater strength throughout. The company name is molded into a new plastic roof cap that will not dent or rust. Unpainted section allows light to enter front part of trailer for improved visibility within unit.

AND AVIATION INDUSTRIES

Chrysler Body Plans Spurred Briggs Sale

Fear that Chrysler was planning to produce its own bodies was a major factor in the sale of Briggs to Chrysler for $35 million. This was revealed in a letter to Briggs stockholders, which pointed out that directors had been concerned over a possible loss of Chrysler business. It has accounted for about 85 per cent of Briggs total automotive sales for many years.

In addition to the $35 million paid for the plant and equipment, Chrysler also will buy inventory on hand at the time of taking over and cost of dies and equipment collectible from customers. The amount is not specified, but it will be many millions. It is understood that Chrysler plans to cut its total salary obligations at Briggs by reducing the number of officers and executives.

Ford Plans Headquarters For New Product Div.

Ford will build a new headquarters building for its newly formed Special Product Div. The new building will be erected on property the company now owns west of Detroit and will provide space for executive and administrative offices and manufacturing facilities. The first project of the division, according to reports, will be development of a new "prestige" car to fill the place of the Lincoln Continental, which has been out of production for several years.

Four-Door Sedans Most Popular Car

Four-door sedans have replaced the two-door sedan as the most popular body style, according to AMA statistics. Figures for 1953 are not yet available, but in 1952 four-doors accounted for 52 per cent of passenger car production, compared with 42 per cent in 1940.

In that year (1940) two-door sedans were in first place with 54 per cent, but had dropped to 34 per cent by 1951 and to 29 per cent in 1952. The hardtop convertible, a new model in the postwar era, is the third most popular design and accounted for 13 per cent in 1952.

ITALIAN WORKHORSE

Hard at work here is the Fiat 55L field tractor, which was recently introduced to both the domestic and export markets. The four-cyl Diesel engine has a bore of 122 mm and a stroke of 140 mm. Maximum output of 55 bhp is obtained at 1400 rpm, while the compression ratio is 15:1. Other features include: fuel injection system; pressure lubrication; gearbox with five forward speeds and reverse; and weight of five tons.

Chevrolet Prices Increase Slightly

Chevrolet has announced that retail prices of its new cars will be $10 more than comparable 1953 models. List prices, however, remain the same, and the increase goes to the dealer. It reportedly reflects added labor costs in getting the new car ready for delivery and future work that has to be done under the new-car guarantee.

Retail Automotive Sales Hit New High in 1953

Figures on all types of automotive sales at retail for 1953, compiled by the Dept. of Commerce, will not be available for some months yet, but, in view of the total for 1952, should be upward of $40 million. In that year retail sales of cars, trucks, parts, fuel, and service stood at a record $38 billion.

The year 1953 was a large one in vehicle and parts production. The greater number of vehicles in use certainly should account for a substantial gain in sales of fuel and service.

By any standard, the gains made since prewar years are highly impressive. In 1941, the prewar record year, total sales of automotive retailers accounted for $12.3 billion. With due allowance for devaluation of the dollar since that time, the current level of activity is 50 per cent higher.

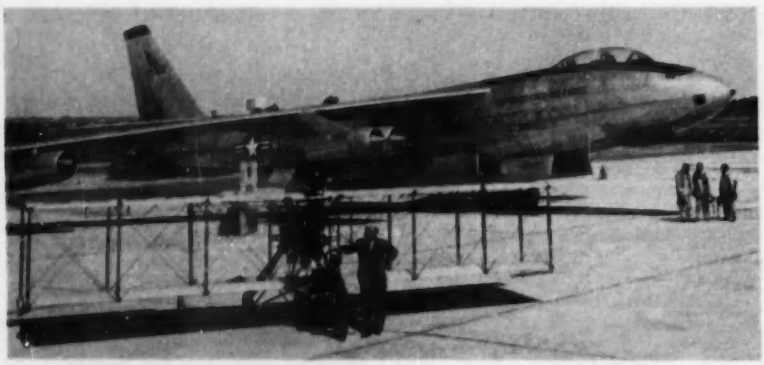
Vehicle Scrappage Rate Twice That of Prewar

Scrappage of cars and trucks currently is at a rate almost twice that existing prior to World War II, and the total is increasing each year. Also increasing is the age of cars scrapped and the total accumulated mileage.

The current scrappage rate is about four million vehicles a year, according to AMA, with the average life at time of scrappage 14 years, compared with 10 years for the prewar era. Accumulated mileage of vehicles now scrapped also is up sharply to 121,000 miles, compared with 85,500 in 1941.

Comparison of current age and mileage figures for scrapped vehicles with those existing in 1925 reveals that vehicles today are much more durable. At that time, average scrapping age was 6½ years, and the mileage was 25,750. Better highway systems also undoubtedly have contributed to the longer life of vehicles built in the last decade.

News of the AUTOMOTIVE



THE OLD AND THE NEW

Over four decades of advancement in aviation design are apparent between the swept-wing Boeing B-47 and the 1912 pusher-type plane beside it. Still flying, the little aircraft is powered by an 80-hp French-built Gnome engine at a top speed of 65 mph. Six GE J-47 jet engines put the huge bomber in the 600-mph class.

Pontiac to Spur Output and Sales Achievements

According to a recent statement by R. M. Critchfield, general manager of Pontiac, the division will build approximately 148,000 cars in the first quarter of this year, about 15 per cent more than in the like 1953 quarter. He also stated that Pontiac plans to improve its percentage of total industry sales this year. Its share has been running around seven per cent.

Central Power System for Accessories Due

A central hydraulic system for power-operated accessories will be demonstrated at the annual meeting of the Society of Automotive Engineers this month in Detroit. A convertible coupe is fitted with a one-gal hydraulic accumulator that provides up to 1000 lb pressure. Greer Hydraulics, Inc., made the installation, which operates windows, seat, steering and the convertible top.

Kaiser Move Presents Pension Fund Problem

Ultimate disposal of the multi-million dollar pension fund covering workers at Kaiser Motors' Willow Run plant will have considerable significance for the automobile industry (see AUTOMOTIVE INDUSTRIES, Dec. 1, 1953, p. 37). Since Kaiser is moving its operations to Toledo, a large percentage of employees face separation from their jobs and loss of their accumulated pension credits.

Trustees of the fund have ruled out a disbursement of the fund, estimated at about $6 million, among employees. They claim it is impossible under provisions of the pension agreement concluded in 1950.

The fund will be used to provide pensions for employees already retired and also for those eligible to be retired soon or in the future. There is some talk among representatives of the workers about starting suit to force distribution of the fund among the employees.

The situation is certainly unprecedented, as it is the first one to arise since pensions generally came into the automobile industry. The Kaiser agreement prohibits any cash settlement to employees in the event they quit or are laid off. It also specifically provides that the fund can only be used for retirement benefits.

The Kaiser pension case is interesting in view of possible mergers or absorptions of companies in the automotive industries which might possibly result in consolidating work forces or reducing total number of employees. The problem also is very likely to result in a new drive by the unions to make accumulated pension credits transferable from one company to another when a worker changes place of employment.

General Tire Plans Expansion of Stock

Shareholders of General Tire and Rubber Co. have authorized changing the company's charter to permit issuing a new class of preferred stock amounting to $35 million. The authorization was for 350,000 preferred shares at $100 par value.

LIGHT JEEP

Three ft shorter and 1200 lb lighter than the standard model, the new Willys "Aero Jeep" has just completed Army Ordnance tests. Its low weight of 1475 lb was achieved mainly by the use of an all-aluminum body, various aluminum parts, and magnesium wheels. Measuring 100 in. from bumper to bumper, it has a top speed of approximately 70 mph.

AND AVIATION INDUSTRIES

United to Sever Ties With Chance Vought

United Aircraft Corp. has announced a plan to establish its Chance Vought Aircraft Div., Dallas, Tex., as a separate corporation. The new firm will be known as Chance Vought Aircraft.

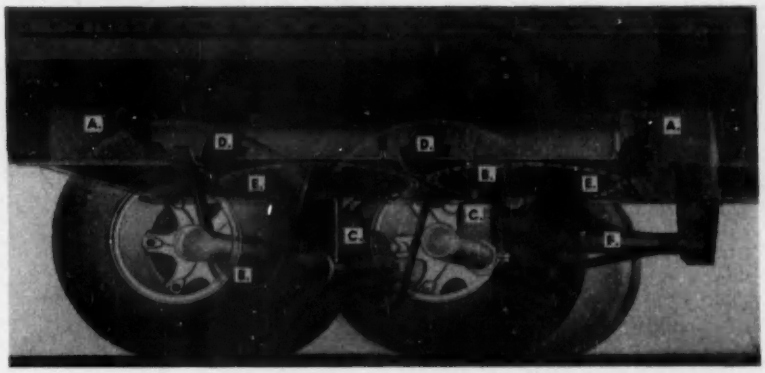
On Jan. 1 certain assets and liabilities of the former Texas unit were transferred to Chance Vought Aircraft, Inc., in exchange for common stock of the new company. During a current transition period, the new company, although a wholly owned subsidiary of United, is operating independently of United.

On or before Dec. 31, 1954, all of the issued shares of common stock of the new subsidiary company will be distributed pro rata to the then holders of the common stock of United. At that time, all officers of United will resign from the board of directors of the new company, and from then on there will be no legal or corporate connection between the new company and United.

No Other Breaks

United has no present plans for taking any similar step with any of its other three divisions, all of which are in Connecticut—Pratt & Whitney Aircraft, aircraft engine manufacturer; Hamilton Standard, manufacturer of propellers and other aeronautical accessories; and Sikorsky Aircraft, helicopter maker.

The plan for the distribution of shares of common stock of the new subsidiary company to the holders of the common stock of United will be submitted for approval or ratification of the common stockholders of United at the next annual meeting to be held in April. The separation of the new subsidiary from United will depend upon satisfactory operations by the subsidiary in fulfilling its defense program commitments and all other responsibilities during the transition period.



VERSATILE SUSPENSION SYSTEM

Recently developed by Air Springs, Inc., is a new type of air suspension unit which may be used for powered vehicles as well as for trailer axles. The pilot model, installed on a tandem-axle semi-trailer has undergone extensive tests, and it is expected that production units will be available in the near future. Various components, as lettered in the illustration, are: A. Low-Pressure Air Chamber; B. Snubbers; C. Axle Straddles; D. Surge Valves; E. Flexible Ring Diaphragms; and F. Torque Assembly.

Vought Status

Chance Vought has unfilled orders for approximately $375 million, which include contracts for its twin-jet Navy F7U-3 Cutlass fighters; for Navy A2U jet-powered attack planes, and for its Navy Regulus guided missiles. Chance Vought also recently won an important Navy competition for the development of a new, advanced Navy day fighter.

Two primary reasons are given for the separation of the Chance Vought unit. First, Pratt & Whitney, which makes engines, deals with the entire aircraft industry, that, of course, competes with Chance Vought. It is reported that this state of affairs has on occasion prevented other aircraft companies from taking Pratt & Whitney fully into their confidence on such matters as designs of new aircraft.

Second, Chance Vought has been somewhat restricted in its operations because of its direct link with United. As an example, the parent corporation has prevented the former from doing business with the Air Force or commercial airlines. Chance Vought will now make his own decisions.

JIG ON CONCRETE

A concrete jig support is shown going into place in the Seattle factory of Boeing Airplane Co., where it has become a part of the B-52 assembly line. The mass of the concrete has proved to have a dampening effect on vibrations, preventing jarring of the precision-set steel jig parts it supports.

News of the AUTOMOTIVE

Fisher Consolidates Plastics Operation

Evidence of the increasing importance placed by General Motors on plastics is the consolidation of all Fisher Body experimental and development work into one operation to be called the Plastic Plant. It will be headed by L. J. Lamm. Fisher has been engaged in plastic development work on dies, jigs, fixtures, forms, molds, and body construction for a considerable period.

Hall-Scott to Produce New Engine for Trucks

Hall-Scott Motor Div. of ACF-Brill Motors Co. has announced that it will soon put into production a new high-powered engine for truck and industrial uses. To be known as Model 590, the unit will be available in both upright and horizontal form for operation on either gasoline or LPG fuels.

The engine will be six-in-line of 590 cu in. capacity with 5-in. bore and 5-in. stroke. Its weight will be under 1400 lb, complete with accessories. With short overall length of under 50 in., Model 590 will reportedly be adaptable to a wide range of vehicle sizes and capacities.

Dual duplex downdraft carburetors will be used with gasoline for the higher ratings. A single two-in. updraft carburetor will be employed for output ratings where reduced power and greater economy are desired. Peak horsepower at governed speed of 2800 rpm with gasoline will be in excess of 200 hp. Both power output and torque will be considerably higher when LPG is used, Hall-Scott claims.

Automotive Parts Sales to Hit $2.7 Billion

Automotive parts and equipment sales this year will reach approximately $2.7 billion, 10 per cent ahead of a year ago, according to C. E. Klaus, president of National Standard Parts Association. He predicts that the replacement parts business will constitute a larger proportion of his industry's sales next year because of the large number of three and four-year-old cars needing repairs.

Hufstader Elected Director of AMA

William F. Hufstader, General Motors vice-president, has been elected a director of AMA. He fills a vacancy on the AMA board created when C. E. Wilson resigned as president of General Motors to become Secretary of Defense.

Ford Broadens Market for Diesel Tractor

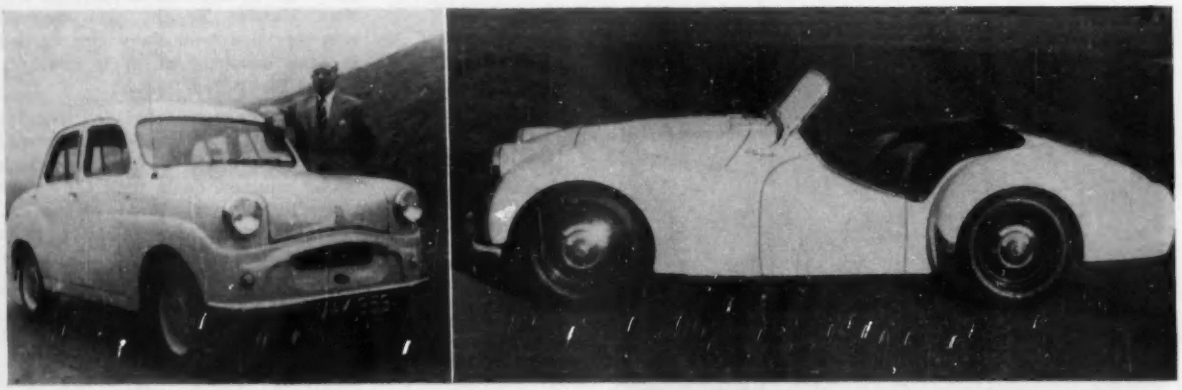
Ford Tractor Div., encouraged by the acceptance of its English-made Diesel farm tractor, plans to expand its distribution considerably beyond the ten western states originally designated. The Fordson Major Diesel tractor (see AUTOMOTIVE INDUSTRIES, Nov. 15, 1953, p. 56), made by Ford of England, was introduced into this country in September.

Acceptance was so good that 15 more states in the midwest and south have been added to the distribution area. The tractor will be available in all states west of the Mississippi River, in addition to Michigan, Wisconsin, Illinois, Indiana, Ohio, and part of Mississippi.

GM, Fruehauf Issues Immediate Sellouts

The investing public still has tremendous confidence in the automobile industry. A $300 million debenture issue offered by General Motors recently was snapped up within a few hours.

Fruehauf Trailer Co. offered $10 million in convertible subordinated debentures which was oversubscribed within two hours after the offering was put on the market.



NEW BRITISH OFFERINGS IN U. S.

Shown here are two of the four cars which Standard Motor Co., Ltd. is offering to the American market through its recently formed U. S. subsidiary (See Automotive Industries, Dec. 15, 1953, p. 21). On the left is the Standard Cadet, which is powered by a four-cyl, 26-hp, 803 cc overhead valve engine with a compression ratio of 7.25:1. Top speed of the car is over 60 mph and fuel consumption is the 40-50 mpg class; price at U. S. ports of entry is said to be $1387. On the right is the Triumph T.R. 2 sports car, powered by a four-cyl, 90-hp, 1991 cc engine with a compression ratio of 8.5:1. Top speed is over 100 mph, and fuel consumption is 24 mpg; it will sell for $2345 at U. S. ports of entry. Other two cars in the quartet are the well-known Standard Vanguard and the new, unusual Doretti.

AND AVIATION INDUSTRIES

Designer Sues Briggs Over Unitized Body

John Tjaarda, an independent consulting engineer, has filed suit against Briggs Manufacturing Co. for $6.5 million damages. The suit alleges breach of contract and patent infringement.

Mr. Tjaarda, director of research and development at Briggs before the war, charges that he perfected 39 inventions primarily covering automobile body designs and entered into a contract with Briggs to give the company exclusive rights. He claims that the contract specified that he would receive no royalties unless the inventions were used, manufactured, or sold by any other firm. In addition, Tjaarda claims that Briggs permitted three other companies to use a unitized body design covered by the contract and that he received no compensating royalties.

The designer charges he has been deprived of more than $4.6 million in royalties and on more than 1.5 million cars employing his body design that have been built by the three automobile companies since 1948. Balance of the $6.5 million asked in damages is made up of other alleged infringements and damages.

Walker Mfg. Buys Plant from Kaiser

Walker Manufacturing Co. has purchased the Kaiser Motors plant at Jackson, Mich. The plant contains nearly 300,000 sq ft of manufacturing area, of which Kaiser has been using about 60,000 sq ft for assembly of the Kaiser-Darin Fiberglas sports car on a very limited basis and for parts storage.

It is reported that Kaiser will lease back from Walker up to 200,000 sq ft of the plant for six months and up to 125,000 sq ft for the following six months. The Walker-Michigan Div. of Walker Manufacturing will use the plant space to produce vehicle exhaust systems for original equipment and the replacement market.

Originally, Kaiser built certain models of the Frazer car at the plant and since last August has produced about 100 pilot models of the Kaiser-Darin which have been used for display purposes. A few of the cars have been shipped to dealers, but there has been no definite announcement as to plans to continue production after Kaiser's lease from Walker expires at the end of 1954.

1953 RETAIL CAR SALES BY PRICE GROUPS*
NUMBER OF CARS

	October				Ten Months			
	1953		1952		1953		1952	
Price Group	Units†	% of Total	Units †	% of Total	Units†	% of Total	Units†	% of Total
Under $2,000	310,193	61.75	211,639	55.62	2,705,816	58.61	1,788,154	52.37
$2,001 to $2,500	137,179	27.31	103,424	27.16	1,361,884	29.09	1,008,146	29.69
$2,501 to $3,500	41,485	8.26	48,847	12.84	593,744	12.25	446,496	13.24
Over $3,500	13,467	2.68	16,606	4.36	186,580	3.85	151,681	4.50
Total	502,324	100.00	380,516	100.00	4,848,024	100.00	3,372,479	100.00

DOLLAR VOLUME OF SALES*

	October				Ten Months			
	1953		1952		1953		1952	
Price Group	Dollars	% of Total	Dollars	% of Total	Dollars	% of Total	Dollars	% of Total
Under $2,000	$544,695,215	54.07	$373,871,904	46.92	$4,834,787,178	47.38	$3,120,006,409	43.84
$2,001 to $2,500	307,291,856	29.95	230,438,409	28.92	3,046,623,491	29.80	2,236,778,688	31.42
$2,501 to $3,500	114,040,925	11.12	131,114,545	16.46	1,629,437,888	15.97	1,204,396,555	16.92
Over $3,500	49,854,271	4.86	61,338,647	7.70	698,651,856	6.85	556,537,614	7.82
Total	$1,025,882,267	100.00	$796,763,505	100.00	$10,203,500,413	100.00	$7,116,719,278	100.00

*—Calculated on basis of new car registrations, as reported by R. L. Polk & Co., in conjunction with advertised delivered price at factory of four door sedan or equivalent model. Does not include transportation charges or extra equipment.
†—New registrations of American made cars only. Does not include imported foreign cars.

Chrysler Charges Rail Freight Rates Unfair

Chrysler is continuing its battle with the railroads over freight charges on new cars from its assembly plants. In late 1951, the ICC ordered the railroads to lower their rates to Chrysler more in line with those charged General Motors and Ford.

Chrysler now has complained that 30 railroads did not put the new rates into effect and that they have been overcharging on new car shipments from the company's Detroit and Evansville plants to the south. The company is reported to be seeking damages, but no specified amount has been announced.

Purchase of Bearings Co. By Federal-Mogul Final

Stockholders of Federal-Mogul Corp. and Bearings Co. of America have approved the proposed acquisition of the property, assets, and business of the Bearings Co. by Federal-Mogul. (See AUTOMOTIVE INDUSTRIES, Nov. 15, 1953, p. 80.) Transfer of assets was made officially as of Dec. 31, 1953. Purchase price was 72,300 shares of $5 par value Federal-Mogul stock.

Bearings Co. will be operated as a division of Federal-Mogul with its service activities coordinated immediately with that of the parent company. The new division will operate under J. W. Brady, formerly Bearings Co. president, who was made a director and vice-president of Federal-Mogul.

Alcoa Holds Forum on Piston Design

Over 130 top automotive design engineers were given access to a large store of piston design information during a recent symposium at the Cleveland Works of Aluminum Co. of America.

A total of 18 papers, presented by Alcoa design, development and research engineers, explained the data on all phases of aluminum piston design. The all-aluminum double transslot piston was demonstrated as an excellent design to meet most automotive engine requirements.

Continued on Page 98

Men in the News

American Steel & Wire Div., U. S. Steel Corp. — Maxwell D. Millard is now assistant general manager of sales.

Goodyear Aircraft Corp., Piloted Aircraft Engineering Div.—**D. W. Brown** has been named manager of project engineering.

Fairbanks, Morse & Co.—**Donald L. Harwood** has been appointed general purchasing agent.

Ex-Cell-O Corp., Industrial Div.—**Jack L. Mustard** is now assistant general sales manager.

Warner Electric Brake & Clutch Co.—**Arthur Schroeder** has been named southeastern application engineer.

Austin Co.—**Harold A. Anderson** has been elected vice-president and assistant general manager.

Ross Gear & Tool Co.—**Francis H. Davis** has been elected vice-president in charge of sales.

Firestone Tire & Rubber Co.—**Joseph A. Meek** has been made director of industrial relations.

AC Spark Plug Div., General Motors Corp.—**Martin J. Caserio** has become chief engineer, automotive products; and **Bruce H. Schwartz**, chief engineer, military products, at both Flint and Milwaukee plants.

Resolin, Inc., Product Development Div.—**Norry W. Hastings** has been named head.

Motor Products Corp.—**L. J. Sorensen** has been promoted to executive vice-president.

Formsprag Co.—**Shepard Barnes** has resigned as president, and **J. Lawrence Buell, Jr.**, has been elected president, general manager, and a director. Barnes will continue as a director, while **David A. Wallace** has also been made one.

Square D Co., Western Div.—**Lawrence G. Maechtlen** is now manager.

Ford Motor Co., Automatic Transmission Div.—**John A. Swint** has been appointed manager of the Livonia, Mich., plant, while **Wycliffe W. Winn** has been made his assistant.

Dodge Div., Chrysler Corp.—William S. Woolsey has been made general sales manager—trucks, and Edward H. Rice is now director of field operations—trucks.

Acheson Colloids Co.—**Frank M. Hunter** has been chosen as service engineer.

Twin Disc Clutch Co.—**Jack N. Yetter** has been advanced to manager of sales promotion.

Eclipse Machine Div., Bendix Aviation Corp.—**Russell S. Johnson** is now director of sales.

Dunlop Tire and Rubber Corp.—**Howard E. Elden** has been elected vice-president in charge of manufacturing, research, and development.

Consolidated Industries—**Ernest A. Fentzlaff** has been selected as sales engineer in charge of sales to the aircraft industry.

Le Roi Co.—**Hugh M. Little** was named a vice-president and **Norman J. Kimber** has been promoted to works manager of the Milwaukee Div.

Geometric Stamping Co.—**Dave R. Jones**, chairman of the board was also elected president; **E. F. Carney**, vice-president and general manager; **Clarence W. Seik**, treasurer and secretary; and **R. C. Barker**, assistant secretary and assistant treasurer.

Ethyl Corp.—**R. J. Ostrander** has been promoted to assistant director of technical service.

Bendix Aviation Corp., Kansas City Div.—**I. F. Richardson, Jr.**, has been appointed assistant general manager.

Westinghouse Electric Corp.—**Kenneth L. Vore** has been appointed general traffic manager.

Ford Motor Co., Parts & Equipment Mfg. Div.—**John S. French** has been made assistant general manager.

Anderson Bros. Mfg. Co.—**Swan F. Anderson** has been named chairman of the board. He is succeeded as president by **Ralph F. Anderson.**

Norton Co.—David Reid, Jr., was chosen as manager, abrasive and bond plants.

Tung-Sol Electric, Inc.—**P. R. Dawson** has retired from his post as staff assistant to the general sales manager.

American Steel & Wire Div., U. S. Steel Corp.—**Edward A. Murray** is now Detroit district manager of sales.

Ackerman Mfg. Co.—**James F. Baxa** has been appointed vice-president and general manager of sales, while **George E. Martin** has become general manager of the factory.

Toledo Scale Co.—**Robert E. Bell** has been made manager of the Electronics Research Engineering Dept.

Firestone Tire & Rubber Co.—**Cyril Wright** has been selected as manager of office and salary administration.

Dodge Div., Chrysler Corp.—**B. M. Carter** has been appointed assistant sales manager for the Pacific Coast.

International Nickel Co. of Canada, Ltd.—**Lance H. Cooper** has been elected a vice-president.

Vanadium-Alloys Steel Co.—**J. P. Gill** has been elected president.

Pennsylvania Peerless Corp.—**John Schlarb** and **Vern Wilson** have been made works manager and general foreman, respectively.

Lyon, Inc.—**William J. Riley** has been chosen treasurer and assistant secretary.

Terry Sales Corp.—**L. S. Farry** is now manager; **H. D. Krieger**, president and treasurer; **W. E. Terhell**, vice-president; and **Leone Bennett**, secretary.

Joseph T. Ryerson & Son, Inc.—**Melvin B. Monson** was named assistant manager of the Milwaukee steel service plant.

Nutting Truck & Caster Co.—**Guerdon S. Allen** and **Stewart S. Shaft** have been elected executive vice-presidents, in addition to secretary and treasurer, respectively.

Gear Grinding Machine Co.—Edgar D. Leon has been elected president and a director.

Torrington Co.—Walter C. Thompson has been elected president, while Ray B. Nichols is executive vice-president.

Minneapolis-Honeywell Regulator Co.—Paul B. Wishart has been named president.

Reliance Electric & Engineering Co.—**John Drollinger, Jr.**, has become manager of the Renewal Parts and Repair Div.; **William C. Mitchell** succeeds him in Toledo as branch sales office manager; and **Robert O. Gee** is now manager of service.

Pennsylvania Salt Mfg. Co.—**W. J. Stoddard** has been named district supervisor in the Michigan district for the Metal Processing Dept.

Parker-Allen Industries, Inc.—**I. Robert Rozett** is now vice-president and director of sales.

Plastic & Rubber Products Co.—**N. B. Nelson** is manager of the new Detroit District Office.

Borg-Warner Corp., Products Div.—**R. B. Crean** was made a vice-president.

American Locomotive Co.—**Henning W. Prentis, Jr.**, and **Col. Willard F. Rockwell** have been elected to the board of directors.

AiResearch Mfg. Co.—**C. W. Reynolds** has been elected vice-president of industrial and public relations and **G. S. Williamson**, vice-president, manufacturing.

H. M. Harper Co.—**Earle A. Channer** has been made general sales manager.

Boeing Airplane Co.—**William H. Cook** has been made senior project engineer for the pilotless aircraft program, while **Harvey D. Gunning** has been named administrative engineer for pilotless aircraft. **Kenneth C. Gordon** has been appointed manager of commercial sales, and **D. M. B. Martin**, manager of military sales. In addition, **G. W. Taylor** was named manager of domestic sales, and **Kenneth J. Luplow**, manager of foreign sales in the Commercial Sales Div.

General Electric Co.—**W. C. O'Connell** is now general manager of the Aircraft Accessory Turbine Dept.

Westinghouse Electric Corp., Atomic Power Div.—**Dr. William E. Shoupp** is now assistant division manager in charge of development.

Sheller Mfg. Corp.—**Tom Bradley** has been elected president.

Aluminum Industries, Inc., Foundry Div.—**Fred N. Eaton** has been made works manager.

National Vulcanized Fibre Co.—**Harry C. Hackett** has been promoted to staff sales manager, while **James O. Otis** has become sales manager.

Gar Wood Industries, Inc., Mattoon Div.—**Hunter Dietz** has been made manager.

Tinnerman Products, Inc.—**Arthur E. MacNall** is now Detroit district sales manager.

H. H. Buggie, Inc.—**C. H. Sharp** has been appointed general manager; **C. R. Thorpe, chief engineer; and R. J. Melcher**, special projects engineer.

General Motors Corp.—**Gaylord M. Coffin** has been named public relations manager for the Detroit region.

Pontiac Motor Div., General Motors Corp.—**Robert W. Emerick** is now director of public relations.

Dow Chemical Co., Bay City Div.—**A. T. Peters** is now plant manager.

Lear, Inc.—**Dean C. Smith** has been elected a vice-president.

Kurt Obran Co., Inc.—**John F. Lampe** has joined as a representative in Eastern Pennsylvania and Southern New Jersey.

Bohn Aluminum & Brass Corp.—**James T. Maunders** has been named director of public relations.

Republic Rubber Div., Lee Rubber and Tire Corp.—**Stanley L. Martin** has been made field engineer.

Youngstown Sheet and Tube Co.—**Frank A. Roberts** is now manager of organizational planning in the Industrial Relations Dept.

Reading Batteries, Inc.—**E. Jeffrey Shea** is now automotive battery sales manager.

Magnesium Co. of America—**George O. Bohrer** has been named chief engineer.

Thermal Research & Engineering Corp.—**Dr. John B. Fern** has been elected to the board.

Hydro-Aire, Inc.—**Richard M. Degen** has been appointed chief engineer.

Lear, Inc., Aircraft Service Div.—**Arthur W. Cruse** has become general manager, and **Dean C. Smith** is now director of customer relations.

Pacific Airmotive Corp., Manufacturing Div.—**Burnham Adams** has been appointed to fill the newly created position of manager-sales, field service and contract administration for the company's manufacturing division.

Kem Mfg. Co., Inc.—**Louis D. Brown** has been elected president.

Necrology

Henry W. Chandler, 51, manager of programming for the Aircraft Gas Turbine Div., General Electric Co., died Dec. 3, at Cincinnati, O.

A. Donnally Armitage, 81, chairman of J. H. Williams & Co. and a director of Buffalo-Eclipse Corp. and United Drill and Tool Corp., died Dec. 2, at Buffalo, N. Y.

Sumner S. Howard, manager of national account sales for AC Spark Plug Div. of General Motors Corp., died recently.

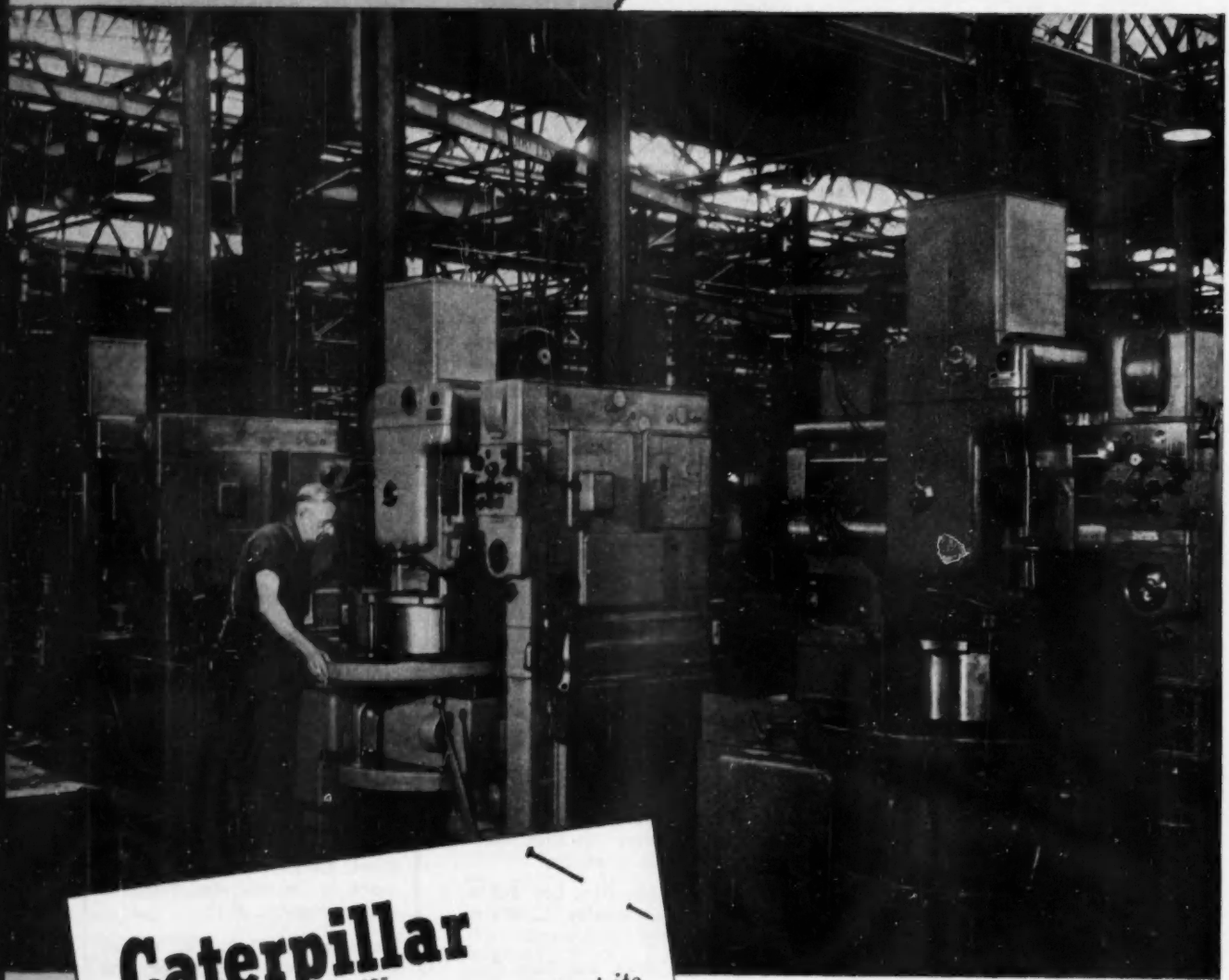
Charles D. Hawley, 52, manager of administration at the Ethyl Corp. Research Laboratories in Detroit, died Nov. 28, at Birmingham, Mich.

Chester I. Hall, 65, retired General Electric engineer and developer of the automobile engine thermostat, died Dec. 6, at Boston, Mass.

Glenn C. Wall, 48, assistant tax supervisor of U. S. Steel Corp., died Dec 3, at Garden City, L. I., N. Y.

John H. Perry, editor of *The Chemical Engineer's Handbook*, died recently, at Wilmington, Del.

Report from Peoria...on Big-Gear



Caterpillar
REG. U. S. PAT. OFF.

selects Fellows 36-Type Gear Shapers, at its Peoria Plant, for high production on unusually wide-face steering clutch drum gears for its Track-type Tractors and No. 6 Shovels.*

**Specially arranged for 8" face-width; standard face-width capacity is 6"*

Time-study Performance: Internal C.I. Gear with 128 8-pitch teeth of 8 inches face width – ACTUAL CUTTING TIME, 29.339 MINUTES. Finished in one cut with Gear Shaper operating at 50 strokes per minute, .0408" rotary feed.

THE *Fellows*

Cutting

The heavy-cut, high-speed capacity of the 36-Type Fellows Gear Shaper makes it a profitable investment wherever quality work is to be turned out on a low cost basis.

Shift-lever and dial controls save set-up and operating time. Choice of 12 cutter-spindle speeds and 12 rotary feeds. Big machine rigidity throughout holds work to traditional Fellows precision. Rated for work up to 36" diameter; spur or helical involute gears; cams or other irregular shapes. *Write for details.*

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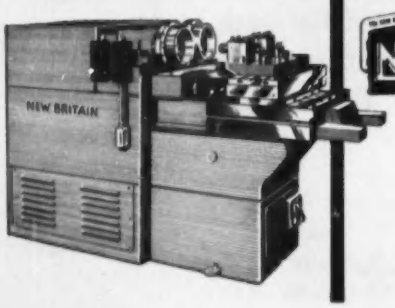
New Britain builds the

Precision Contour Boring Machine

Eliminates the production problem on parts designed with unusual contours.



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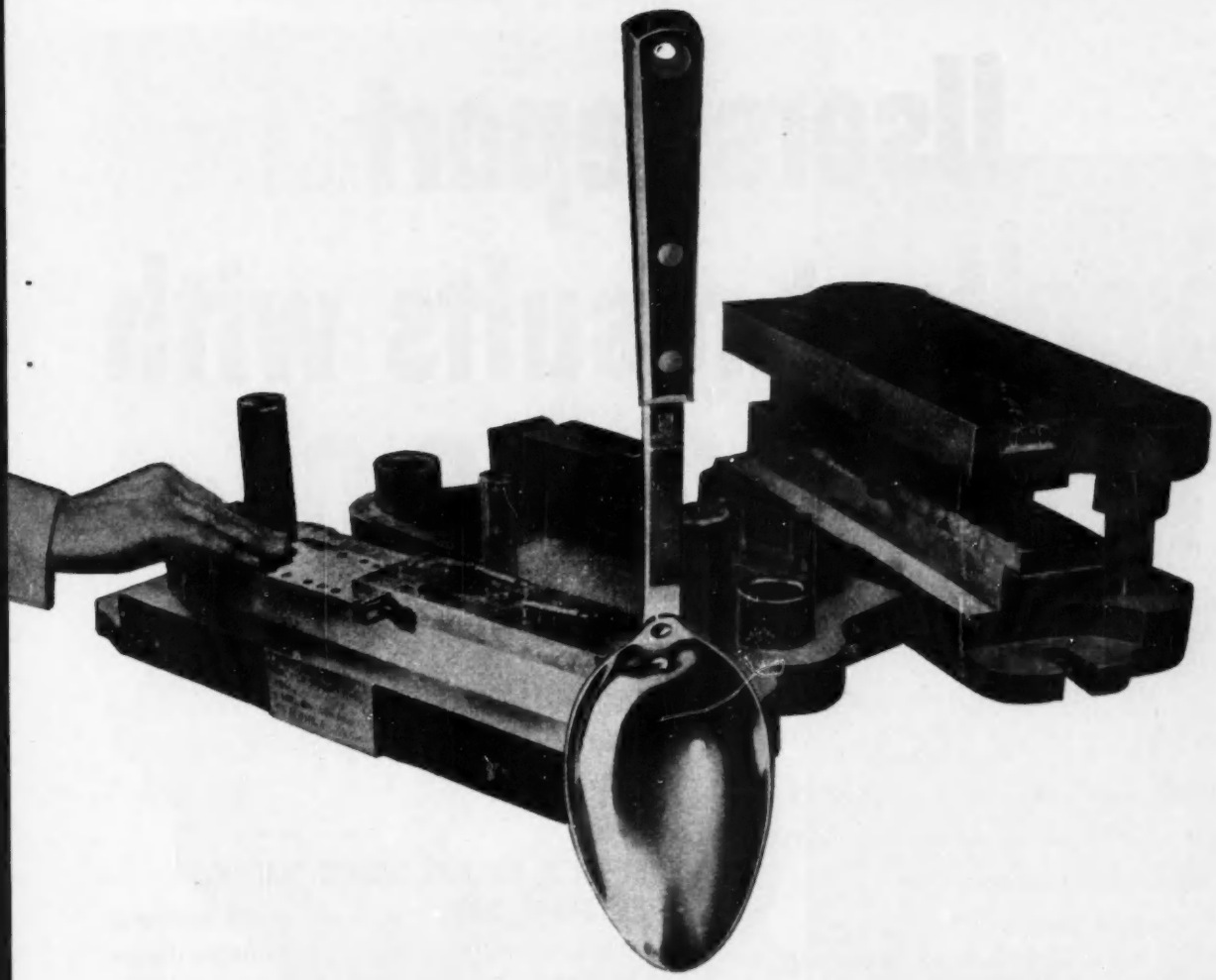
Precision Boring Machines
Lucas Horizontal Boring, Drilling and Milling Machines
New Britain +GF+ Copying Lathes

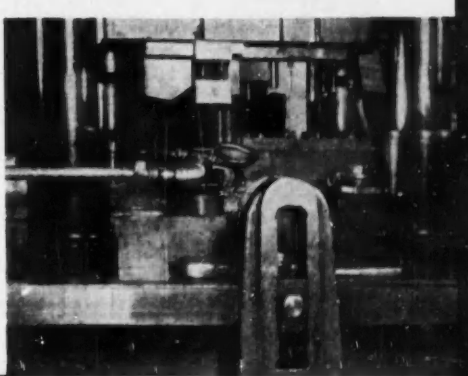
NEW BRITAIN *Automatics*



Ekco DEPENDS ON DANLY to save tooling time!

This popular basting spoon is one of thousands of famous household items made by Ekco Products Company in dies mounted in Danly Die Sets. Ekco depends on Danly Die Sets to save costly tooling time and help maintain uninterrupted production schedules in this highly competitive industry, because Danly Die Sets provide the finest *precision* starting point for diemaking. They are available on short notice from a completely stocked Danly assembly plant nearby.

It's a point worth remembering . . . when the job calls for *precision* performance, *depend on Danly Die Sets!* There's a Danly Branch near you . . . stocked for immediate delivery.



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Users report excellent results with New Sunicut S Oils

In just six months, these unique new straight cutting oils have "Job Proved" themselves as top performers in many metalworking shops all through the industry.

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SCREW MACHINE SHOPS REPORT, "The versatility of Sunicut 209-S permits us to reduce the number of oils we must stock."

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SMALLER IN SIZE ...BIGGER IN OUTPUT!

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SMALL
only 8-1 16" x 8-5 16" x 8-3 8"

POWERFUL
17,800 BTU Output

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split core and tank travel water further — heat lingers longer

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"Continuous service" bus type motor — heavy duty truck service core

ADAPTABLE FOR RECIRCULATING OR FRESH AIR
Simple to connect to top or side cowl for fresh air intake

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Each Evans unit is custom engineered for its specific vehicle installation, to provide a completely satisfactory heating and ventilating system. Evans units are available for a wide variety of commercial vehicle applications.

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Charles J. McCarthy, president, Institute of Aeronautical Sciences; Frederick S. Blackall, Jr., president, American Society of Mechanical Engineers; Roy T. Hurley, chairman and president, Curtiss-Wright Corp.; Robert Cass, president, Society of Automotive Engineers, Igor I. Sikorsky; and Dr. Jerome C. Hunsaker, chairman, NACA, gather for the 50th Anniversary Luncheon honoring engineers' contributions to powered flight. Mr. Hurley presided at the luncheon.

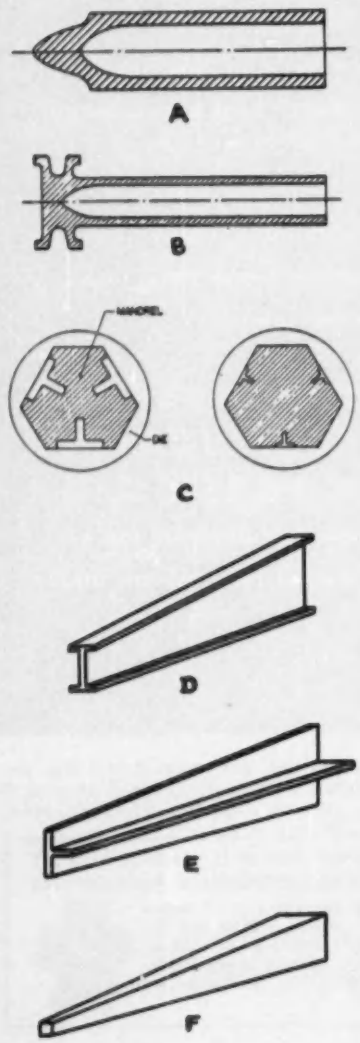


FIG. 1

Unusual shapes possible from extrusion presses.

Heavy Press Program Among Features at ASME Meeting

By Paul Kennedy

LATEST aspects of the Air Force heavy press program; management problems with automatic factories; and papers devoted to machines, torque converters, dies, aircraft engines, and helicopters were important features of the seventy-fourth Annual Meeting of the American Society of Mechanical Engineers last month. Over 7000 engineers gathered in New York City to attend 126 technical sessions and hear more than 300 papers presented.

Other engineering groups joining in the meeting included: American Institute of Electrical Engineers, American Rocket Society, American Society of Lubricating Engineers, American Society for Testing Materials, Institute of Aeronautical Sciences, National Security Industrial Association, Society of Automotive Engineers, Society for Experimental Stress Analysis, Society of Naval Architects and Marine Engineers, and the Transport Air Group.

The election of Lewis K. Sillcox, honorary vice-chairman of the New York Air Brake Co., as president of ASME for 1954 was announced.

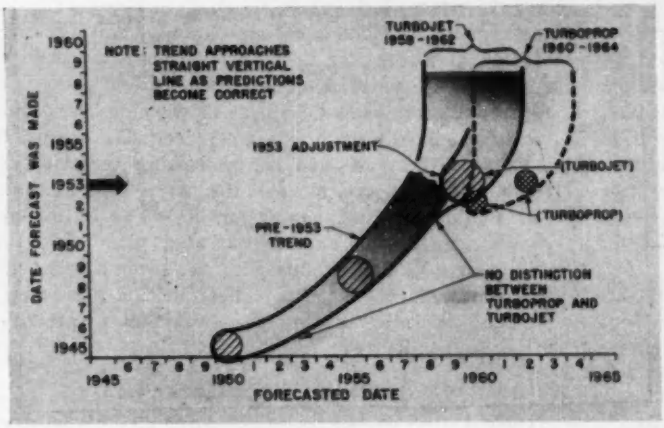


CHART 1

Trend of Predictions on Estimated Date of Initial Scheduled Operation of U. S. Turbine Transports.

Heavy Presses

Latest data on design and operation of presses in the revised Air Force program were presented at several sessions (see also AUTOMOTIVE INDUSTRIES for Jan. 15, 1953).

The results of preliminary test runs on a 14,000-ton extrusion press now being installed at Aluminum Co. of America's Lafayette (Ind.) Works were described. It is being installed by the Air Force as a part of the Heavy Press Program. Some details of the press design, the work it is expected to do and the way it will be operated were discussed by C. R. Anderson, assistant superintendent of the Lafayette extrusion plant. As each of the three rams can be operated separately, the press can be used either at a 5700 ton, 8300 ton or 14,000 ton capacity. The 1500-ton stretcher will straighten extrusions as long as 120 ft after heat treating. Separate induction heating facilities will be employed to heat both the extrusion billets and the press extrusion tools. Furnaces are provided for solution heat treating and for artificial aging. Quenching facilities have been installed for extrusions as they emerge from the solution heat treating furnace. As an aid to designers, the extrusions which will be available from the new press were outlined and compared with extrusions now available from existing presses.

The original Air Force light-metals forging-plant presses for Newark, Ohio, were discussed in a paper by E. V. Crane, chief, special engineering, and W. R. Jackson, development engineer, E. W. Bliss Co. The paper covered particularly hydraulic systems, pumps, tanks, air bottles and controls and the safety precautions incorporated for the protection of equipment and operators. General arrangement of the plant and specific circuits of the 3000-ton and 25,000-ton capacity presses were illustrated and discussed.

Weight saving in the Republic F-84F swept-wing fighter, which has a large number of forgings both small and large, was shown by F. E. Hyatt, Jr., chief weights engineer of Republic Aviation. Approximately 19 per cent of the airframe weight is light metal forgings and if just the structural airframe weight is considered this percentage goes up to 30 per cent. All of the wing inter-spar ribs were made from forg-

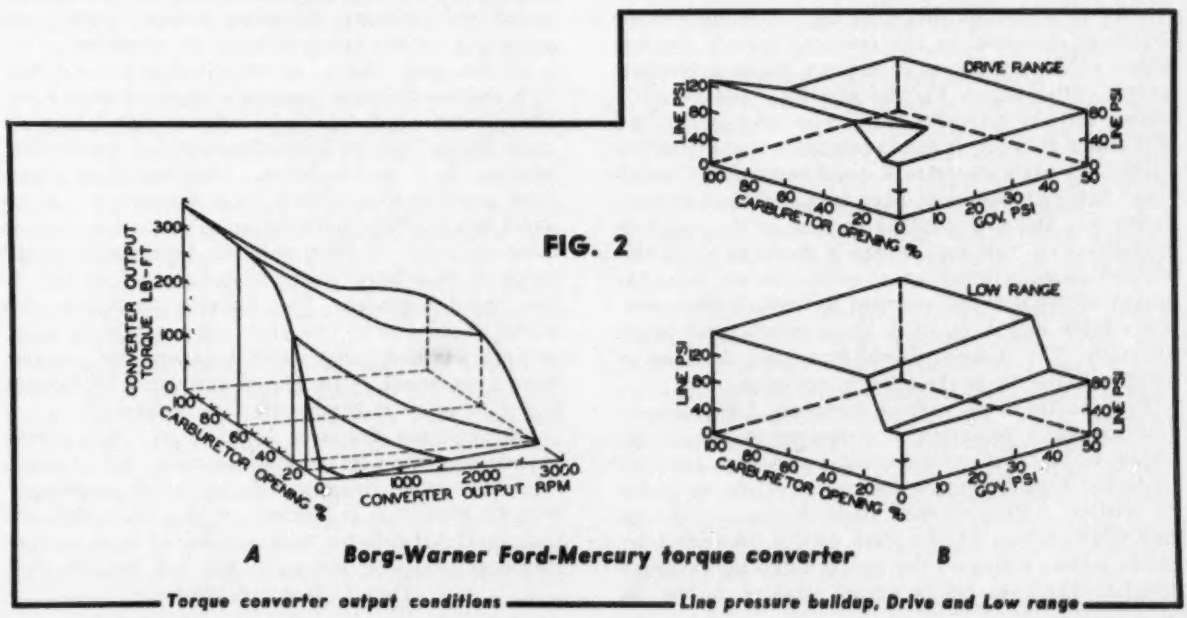


FIG. 2

A Borg-Warner Ford-Mercury torque converter B

Torque converter output conditions — Line pressure buildup, Drive and Low range

ings. Webs, caps, stiffeners, even fuel cell interconnecting fittings were combined into these forgings. Due to changes in the wing design, a direct comparison between the weight of the forged ribs of the production swept-back wing and the "built-up" ribs of the prototype swept-back wing would not be a true picture. However, a few of the ribs in which a direct substitution was made are: 88.7 lb down to 82 lb per airplane, 33.5 lb to 20.6 lb per airplane, and 35.2 lb to 31.2 lb per airplane.

The auxiliary spar is comparable with the ribs in size and resulted in a weight savings of seven lb per airplane when changed to a forging on the production airplane. The biggest change was in the design of the main spar of the wing. The inboard section built-up was 184 lb, forged 161 lb; the center section built-up was 72 lb, forged 58 lb; and with the outboard section retained built-up at 18 lb, a weight-savings of 74 lb per airplane was realized.

An account of the progress made in utilizing the extrusion press to produce a variety of shapes heretofore considered unsuitable to this process was given by H. Albers, chief engineer, G. Krause, chief designer, and A. Greensite, design engineer of Loewy Construction Co. The material covered methods using existing presses for longitudinally tapered, step and multi-shouldered extrusions; also, combined die forging and extrusion as shown in Fig. 1. The outlook for automatic operation of improved presses was discussed together with some proposed designs. A radically new method of fabricating hollow propeller blades was presented and developments in this area explored. Some of the most significant developments will be forthcoming when exploring the possibilities of combined forging and extrusion on a heavy press. The ram and stem could be utilized in conjunction with a closed die cavity to form a predetermined forged shape, following which the extrusion could proceed past an extrusion die in the normal manner. Some shapes that can be fabricated in this manner are shown in A, Fig. 1. An extension of this principle would incorporate auxiliary cylinders on the press to actuate the two halves of a closed die cavity to forge the more intricate shapes, after which the die cavities could be withdrawn and the extrusion die carrier advanced to permit either direct or inverted extrusion to complete the cycle. The parts shown in B could be produced in this way. Some unique ideas have been advanced recently to produce extruded sections varying in the longitudinal direction. One such design is shown in C. In this method, recesses whose cross section varies along the length of the mandrel are used to produce simultaneously three extrusions of T shape which taper longitudinally. This is accomplished by moving the mandrel relative to the die as the billet is extruded.

Perhaps the most radical departure from convention extrusion technique is embodied in the design shown in D. This scheme utilizes split dies that can be moved laterally during the course of the extrusion to produce a longitudinally tapered section. The up and down motion of the split dies is controlled by power screws acting on the dies through intermediate wedges. The fixed die is rigidly attached to the die carrier and provides a backup surface to prevent extrusion of metal past the gap opened by the moving split dies. A modification of this scheme to produce a tapered T section, E, has three movable die segments with three fixed backup dies, the principle of operation remaining the same. In an interesting variation of the split die concept, movable die pieces bear at their end surfaces against cam segments. The latter are rigidly attached to an internal ring gear which is driven by a pinion. Rotation of the ring gear moves the cam surfaces to permit linear motion of the die segments, thereby varying the die orifice to produce a tapered section, F.

Design Problems

Commenting on the turbo compound aircraft engine in future transport use, R. R. Mock and N. B. Jamieson, project engineers at Curtiss-Wright Corp., drew up Chart 1, which shows the trend of what industry forecasters have been predicting as to the approximate date that scheduled U. S. turbine transport operation may begin. The vertical scale indicates the year a forecast was made, and the horizontal scale shows the date predicted in the forecast. Some forecasts may have been missed and some slightly misinterpreted, but the general trend curve is believed to be fairly valid.

As shown by the cross-hatched areas, there have been four active forecasting periods since the end of World War II: the first, right after the war; the second, around 1948-49; the third, in 1952, when the Comet started scheduled operation; and the fourth, in 1953, probably stimulated by active airline study of specific turbine transport proposals.

This curve might better have been referred to as the "clouded crystal ball calibration curve." The fact that the predictions have been continually optimistic is not surprising, since due to unpredictable obstacles, problems always seem to take longer to solve than originally estimated. Apparently, the difficulties associated with planning, designing, testing, selling, and producing turbine transports are no exception.

As the curve shows, in 1945 it was thought that U. S. turbine transport operation might start in about 1950. Latest predictions now indicate that it may not start before 1959 or 1960. The trend of predictions, however, is more consistent. The first three points form a reasonable looking trend towards a vertical line which is what should happen as predictions become more accurate. In 1953, however, presumably as the result of reaction to closer studies, an adjustment to this trend appeared. The turbojet prediction was moved ahead one to two years, and a differentiation between jets and props, which began in 1952, became more pronounced. This moved turboprop predictions two to three years farther into the future,

Extrapolating the area contours of these trends (considering the adjustments) to where they become straight vertical lines, a time range of presumably accurate prediction is formed. On this basis, the ultimate predicted date for the beginning of U. S. turbine transport passenger operation will fall into the fol-

(*Turn to page* 118, *please*)

The Crestline Skyliner has a transparent roof section of blue-green tinted molded sheet plastic over the driving compartment.

New T-800 Series tandem axle truck, the first tandem unit ever built by Ford. It handles payloads, with body, up to 29,943 lb. As a tractor it pulls a gross combination of 60,000 lb.

Ford Cars and Trucks for '54

MECHANICAL features of Ford's new line of passenger cars are an entirely new 130-hp OHV V-8 engine, a new 115-hp OHV six-cylinder engine, and new ball-joint front suspension. This year for the first time, a choice of either V-8 or six-cylinder engines is offered with all models. Descriptions of Ford's new overhead-valve engines start on next page.

Three lines of cars again are offered—Mainline, Customline and Crestline—with 14 body styles. Three new body types added this year are: the Crestline, Skyliner and a Crestline Fordor Sedan, featuring luxurious interior trim; and a new Customline two-door Ranch Wagon.

The all-new Skyliner has a transparent molded plastic top, tinted blue-green, which covers the entire driving compartment.

Set in a weather-tight rubber seal and framed by bright metal molding, the plastic top is said to block out 60 per cent of the sun's heat rays and 72 per cent of the glare. Under extreme heat, a taffeta sunshade, which matches the headlining, can be snapped into place beneath the plastic section.

Somewhat similar to the Skyliner's roof features is the transparent plastic panel which has been inserted in the Sunliner convertible top over the driving compartment. Extending from the windshield header to the first bow and across the width of the car inside the side rails, the plastic insert is tinted blue to reduce sun glare. A sunshade made of material which matches the underside of the top lining, can be snapped in place quickly if needed.

The 1954 passenger cars have a new grille, recessed parking lights and jet-type air scoop. There is a new Delta-wing type hood ornament; an increase of half an inch in the height of the crown of the front fenders, and a new diagonal slant to the headlamps.

Tail lights have been given a new treatment with black rectangles set into the molding. The circular red lens has a three-pointed star inset and tail lights, brake lights and turn signal lights are all within the one lens-unit. The ammeter and oil pressure gages are replaced by red warning lights which flash on when the generator is not charging or the oil pressure is low.

Power steering of the hydraulic, steering linkage type; power brakes; a four-way power front seat which raises 1¾ in. and moves back or forth 4¼ in. by means of two electric motors; power window lifts; Fordomatic automatic transmission; and overdrive are available as extra-cost optional equipment.

Ford's 1954 line of trucks, powered by five new overhead valve truck engines, includes the first tandem axle unit ever built by Ford. The five truck lines, in 24 series and more than 220 models, range from 4000 lb GVW rating to 40,000 lb.

(*Turn to page* 108, *please*)

Ford Adopts Overhead Valves

By
Joseph Geschelin

APPROXIMATELY 900,000 man-hours expended on the design and development of a unified engine program, coupled with the building and testing of some 640 experimental engines provided the groundwork for the noteworthy line of Ford Division powerplants for 1954 Ford passenger cars and trucks, including the long awaited Ford overhead valve V-8.

Examination of the table of mechanical specifications will show that Ford Division offers seven different powerplants, including the revised Ford Six and the newly designed Ford V-8, five different engines being available in the Ford truck line.

From the standpoint of engineering philosophy, all of these engines exhibit a resemblance in basic design features; all are of overhead valve construction; all V-8's are of 90-deg V type; all have valve rotators on intake and exhaust valves. There are other significant similarities such as the use of an externally-mounted oil pump (except on Ford 6) and full flow oil filter, for example.

Despite these obvious similarities, it is noteworthy that very little interchangeability exists between passenger car and truck engines, in fact none with respect to major parts such as cylinder heads, blocks, pistons, etc. Consequently, even where the displacement is the same, indicating the same bore and stroke, the assembled engines differ in many respects.

One may wonder, therefore, just what is the role of a unified overall design similarity. As mentioned earlier, the family of engines has advanced engineering features common to all. Beyond this, the similitude of design is aimed at facilitating the manufacture of common parts over the same automatic transfer machine lines. For example, cylinder heads or cylinder blocks or crankshafts are so designed as to permit machining through the same transfer machine—whether the part is intended for a passenger car or truck engine. Differences in details are taken care of by the introduction of extra heads in a transfer machine which are alternately cut in or out of the automatic machine cycle, by suitable controls, depending upon the part being handled at the time.

At the Cleveland automatic engine plant where Ford Sixes and 256 cu in. V-8's are produced currently, there is a fully automatic piston machine line, described in AUTOMOTIVE INDUSTRIES April 1, 1953. There is an

1954 FORD ENGINE DATA

Engine	Ford 6	Ford V-8	Truck 6	Truck V-8 239	Truck V-8 256	Truck V-8 279	Truck V-8 317
No. Cyl.	6	8	6	8	8	8	8
Type	In line overhead valve	90° V overhead valve	In line overhead valve	90° V overhead valve	90° V overhead valve	90° V overhead valve	90° V overhead valve
Bore (in.)	3.62	3.50	3.62	3.50	3.62	3.56	3.80
Stroke (in.)	3.60	3.10	3.60	3.10	3.10	3.50	3.50
Displacement (cu in.)	223	239	223	239	256	279	317
Compression ratio	7.2 to 1	7.2 to 1	7.2 to 1	7.2 to 1	7.2 to 1	7.2 to 1	7.2 to 1
Maximum bhp	115 @ 3900	130 @ 4200	115 @ 3900	130 @ 4200	138 @ 3900	152 @ 3800	170 @ 3900
Maximum torque* (lb. ft)	193 @ 1000–2200	214 @ 1800–2200	193 @ 1000–2200	214 @ 1800–2200	226 @ 1900–2400	246 @ 1800–2400	286 @ 1700–2300
Bhp per cu in. displacement	0.516	0.544	0.516	0.544	0.539	0.545	0.536

* Bhp and torque corrected to 60 F dry air at 29.92 in. of mercury.

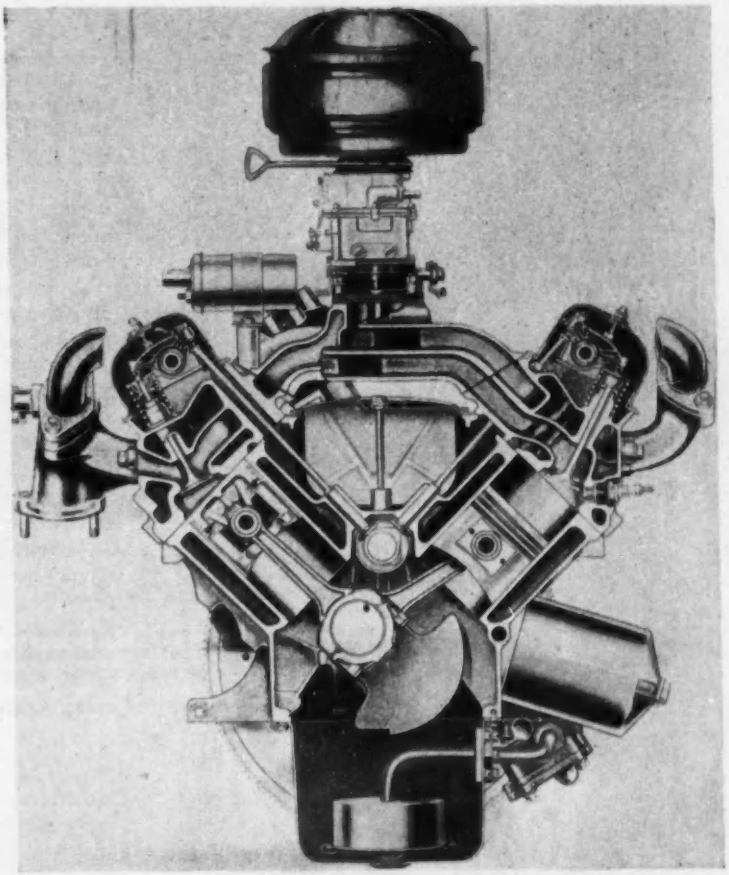
for All Car and Truck Engines

enormous advantage from the standpoint of initial investment as well as manufacturing cost to have all pistons produced in this plant of the same basic size since they can be run over the same lines for most operations. Whatever differences there are, can be handled readily by introducing certain extra operations. But this does not affect the flow of machining on the major automatic lines.

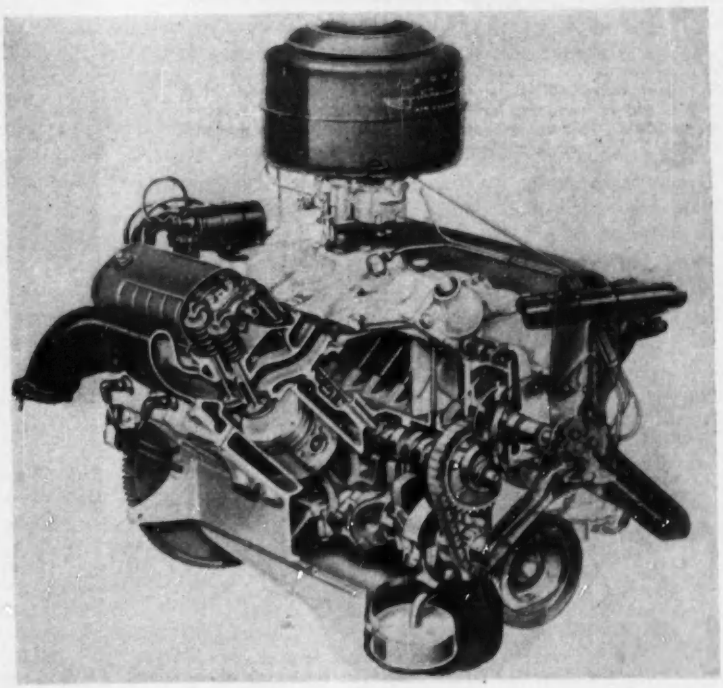
Another noteworthy feature, carried across the board in the new engines is the compression ratio of 7.2 to 1 in conjunction with high turbulence combustion chamber design, said to have extremely low energy loss. With this setup all engines operate satisfactorily on regular service station fuels. And all engines have high values for Bhp/cu in., well within the values for the spread of new overhead valve V-8 passenger car engines introduced in recent years, this being of particular significance with respect to Ford truck engines.

The new Ford OHV V-8, in common with the rest of the engines, has a basic design incorporating short-stroke, low-friction characteristics said to promote high performance with greater economy and longer life. The philsophy on all Ford engines is one of painstaking attention to structural rigidity. This is best exemplified by the development of a deep-skirt crankcase with parting line well below the main bearing cap line, wide-base connection with the flywheel housing to afford better and more rigid anchoring of the transmission, and a shorter, stiffer, and lighter crankshaft.

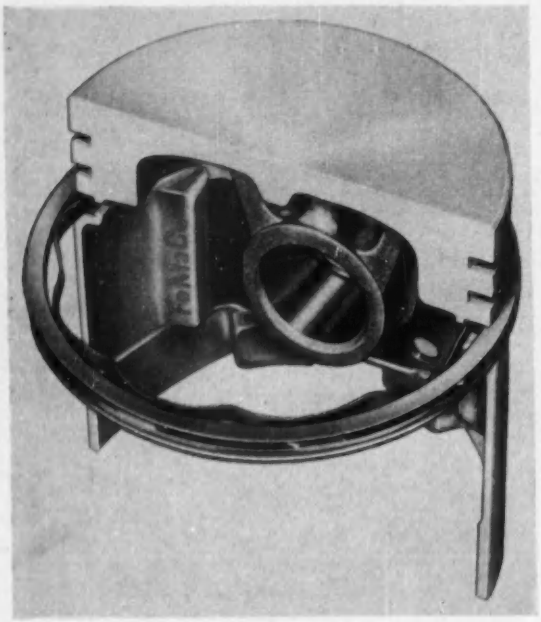
The V-8's, including the new Ford



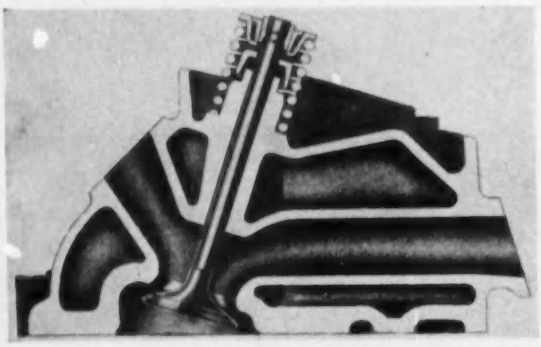
Ford Power King V-8 transverse cross-section, typical of the new family of Ford passenger car and truck engines.



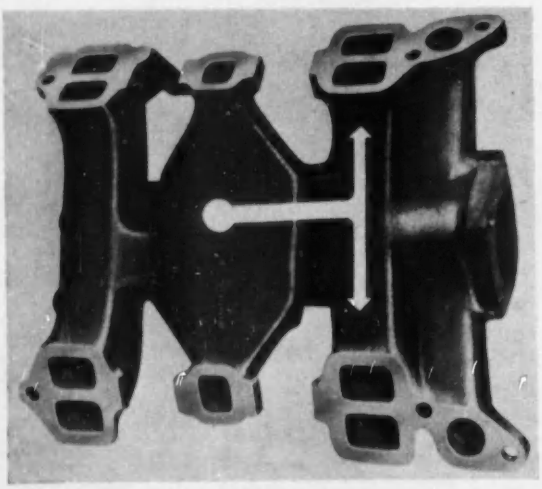
Three-quarter front view and partial cutaway of new Ford V-8, OHV engine.



Typical heavy duty piston used in 1954 Ford engines, emphasizing the expander type oil control ring.



Integral valve guides, a feature of the new Ford OHV V-8's, aid in reducing critical valve temperatures more than 100 F. This cross-section also illustrates the method of installing valve rotators.



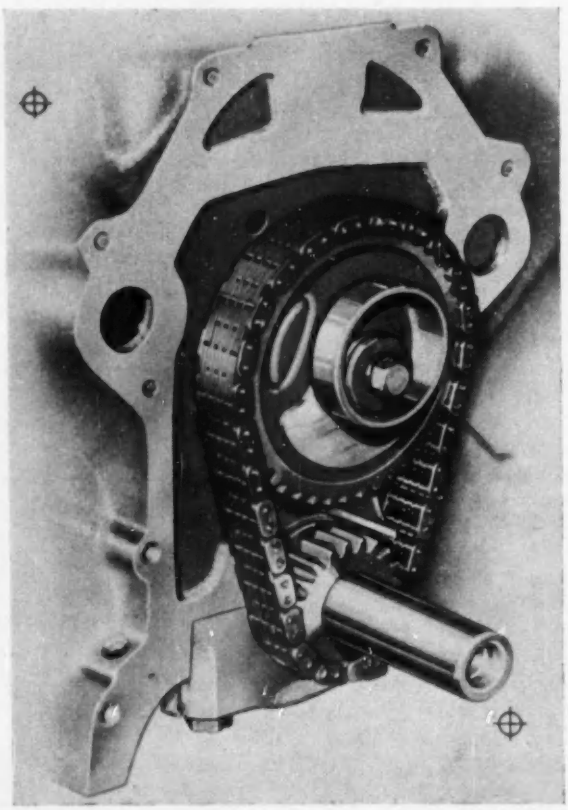
Ford OHV V-8 T-section intake manifold, featuring over-and-under passages, aims at equal length passages, assuring equal distribution of mixture to all cylinders.

engine, all have five main bearings with bearing supports extending upward through the block to form stiffening bulkheads. Cylinder bore distortion, one of the major problems in engine design, has been eliminated by locating cylinder head fastening bosses only on outside walls, entirely divorced from the cylinder barrels. Both bosses, however, are closely spaced about the bore to permit use of thin, all-steel cylinder head gaskets.

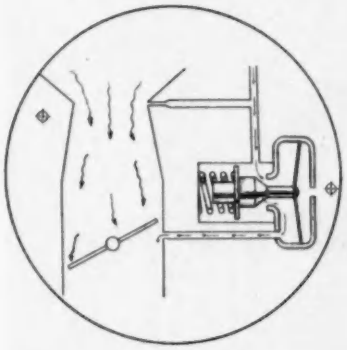
A flat sealing surface and a shallow, more rigid oilpan are made possible by the extended crankcase parting line, permitting a simple, one-piece gasket.

All new engines, including the Ford V-8, have a separate connecting rod cap forging and employ separate connecting rod bolts. To this end, Ford uses a cam-headed bolt, fitting into an eccentrically counterbored pocket. Not only does this prevent turning, but the eccentric counterboring also avoids weakening of the connecting rod web.

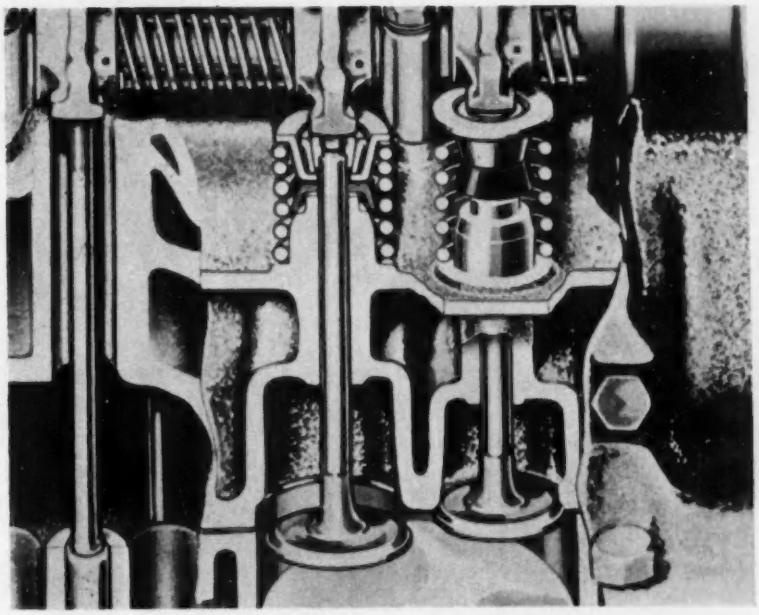
Aluminum alloy pistons with steel struts are used in all engines, passenger car engines being fitted with three rings, using an expander type oil control ring. Truck engines, on the other hand, have heavier pistons with stiffer head construction. They employ four rings on the 152- and 170-hp models, the two oil control rings being nested in the wider lower groove.



View of one-inch camshaft chain drive on the Ford OHV V-8. The fuel pump is driven by the chromium-plated eccentric seen on the front of the camshaft sprocket.



Fuel-vacuum spark control has been improved on Ford V-8's by adoption of a new vacuum control valve, designed to prevent loss of venturi vacuum when manifold vacuum is low. At idling, shown here, atmospheric pressure on the diaphragm holds the valve open. At full throttle, low manifold vacuum allows the valve to close.



Neoprene umbrellas are fitted to both intake and exhaust valve stems to control amount of oil fed to the valve guides. The umbrellas move up and down with the valves covering the entrance to the guide when the valve is open.

The five-bearing crankshaft on the new Ford V-8, precision-molded of alloy iron, is 16 lb lighter than the former design and provides more main bearing overlap to contribute to greater torsional rigidity. As a matter of fact, the Ford V-8 was found to be so free from torsional vibratin, inherently, that it does not require the usual torsional vibration damper.

Main and connecting rod bearings are of interchangeable, steel-back type, with thin babbitt lining on passenger car engines, copper-lined alloy on truck engines.

Referring to the valve mechanism on all Ford engines, non-surge valve springs are used with damping coils at the lower ends, shot-blasted for durability. Integral valve guides, bored directly in the head, are said to reduce critical valve temperatures by more than 100°F. They provide a full-length, oil bearing surface for the valve stem. Intake and exhaust valves are provided with a simple Neoprene shroud to prevent leakage of oil.

A one-inch timing chain is employed for driving the camshaft. The fuel pump is driven by a chromium-plated eccentric on the front of the camshaft sprocket. In addition, a counterweight is provided to compensate for the action of the eccentric. The entire drive is extremely compact.

Short, compact rocker arms are precision-molded of pearlitic malleable iron to promote strength and long wear.

A single, cartridge-type thermostat is used, together with a by-pass for quick warm-up.

Manifolding on the Ford V-8 is noteworthy, featuring a T-section over-and-under type intake manifold with balanced-length passages to assure equal distribution of mixture to all cylinders. This design is said to permit the use of largest possible port areas. Passages are smoothly contoured and proportioned to provide a short and easy path from the carburetor. When the engine is cold, exhaust gases are by-passed through the central chamber around the passages to warm the incoming mixture.

Full-vacuum spark control is improved by the introduction of a new vacuum control valve which prevents loss of venturi vacuum when manifold vacuum is low. As a result, the proper spark advance is maintained over a wider speed range, resulting in a higher and flatter torque curve at high speeds.

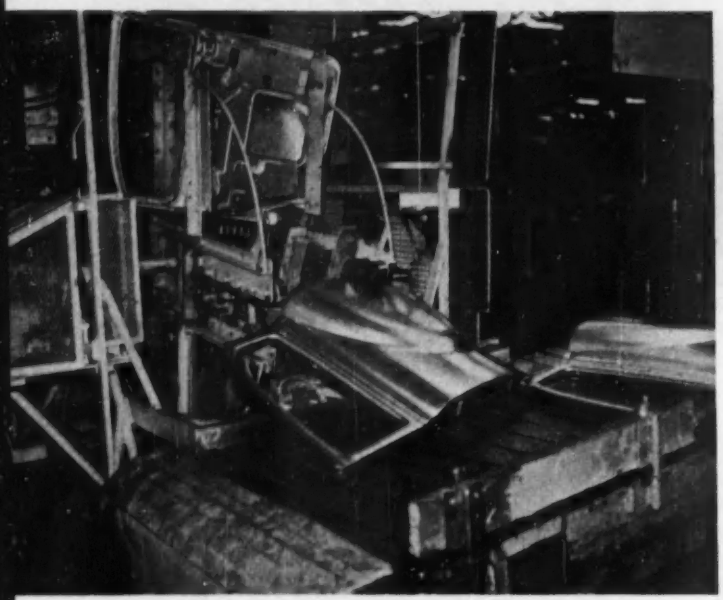
Consider now some of the changes effected in the Ford OHV Six. In the first place, as noted on the mechanical specifications table, displacement and horsepower ratings have been increased over 1953. Because of the introduction of the new front suspension system, it became necessary to reshape the oilpan to provide the necessary clearance. This, in turn, made it necessary to relocate several of the engine accessories as well as their mounting on the block. A new camshaft also was required, with interchange of the positions of the distributor drive gear and fuel pump eccentric.

The new 138-hp Power King V-8 is intended for Ford trucks in the range of GVW ratings from 16,000 to 19,500 lb. The former L-head Big Six, replaced by this engine, is dropped from the line. Standard equipment includes a special duplex economy carburetor and intake manifold, as well as the vacuum-operated governor. Although the displacement of this engine is only 2 cu in. more than that of the former Six, it produces 23 per cent more horsepower.

A noteworthy feature added on this engine is the

(*Turn to page* 116, *please*)

Automatic Welding Lines for Fisher Body Components



Door Assembly Line . . .

FIG. 1

Ferris wheel fixture used to automatically unload final welding press on door line. The unit is equipped with rubber rollers and transfers work to steel slat conveyor.

Thoma[illegible]t New

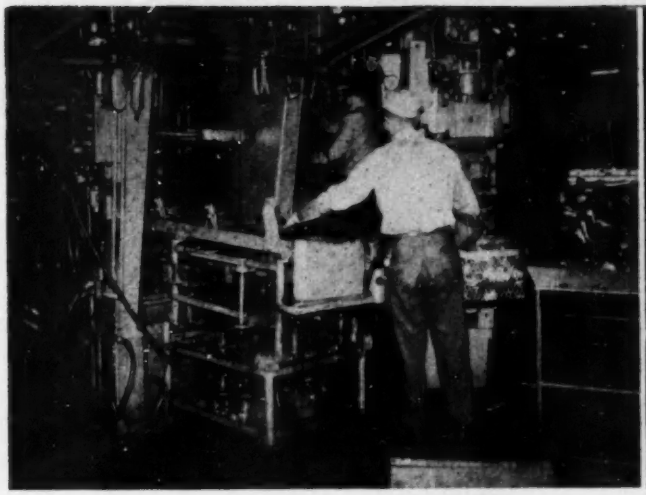
IN addition to a great deal of emphasis on press automation by the automobile body manufacturers, there has been much work done toward the goal of completely automatic welding lines for sheet metal body components. An example of the strides taken is the Fisher Body Plant in Hamilton, Ohio. which is said to be one of the largest present-day users of welding automation for automotive component parts manufacture.

On the whole, every welding line, which is integrated with the automated sheet metal stamping operations preceding, conveys material by mechanical means for the joining phase. Many conveyors, plus automatic loading and indexing devices, have been incorporated in the layout to allow only a minimum amount of manual material handling with the resultant benefits provided by automation.

Since both Chevrolet and Pontiac body parts are being produced over the same lines, utilizing different assembly jigs and fixtures, the plant had to plan its welding setup for rapid changeover and flexibility of operation. Use has been made throughout the welding assembly lines of air-operated automation devices, excluding of course the large variety of conveyors utilized to carry the work in process. The welding guns are of the hydraulically actuated type.

On the two lines utilized for Chevrolet and Pontiac doors there is a series of conveyors between the line of welding presses, and an interesting Ferris wheel device and steel slat conveyor at the end of the line. Doors traveling over the lines are initially assembled—inner and outer panels placed together—by hand. They travel to a clinch fixture by conveyor and to the first weld press by a roll-slide type conveyor. At this point, door sections are positioned manually and inserted in the press for a total of six direct welds and 23 series welds. The part is then conveyed to a punch press for the die operation on the hem flange. Again the part moves over a conveyor and is manually located and inserted into a press for final welding. Here, the workpiece receives 25 series of welds and five direct welds. In this press, the part is unloaded automatically by means of the Ferris wheel type fixture pictured in the accompanying illustration, Fig. 1.

This Ferris wheel unit is equipped with rubber rollers to prevent surface damage to finished doors. It



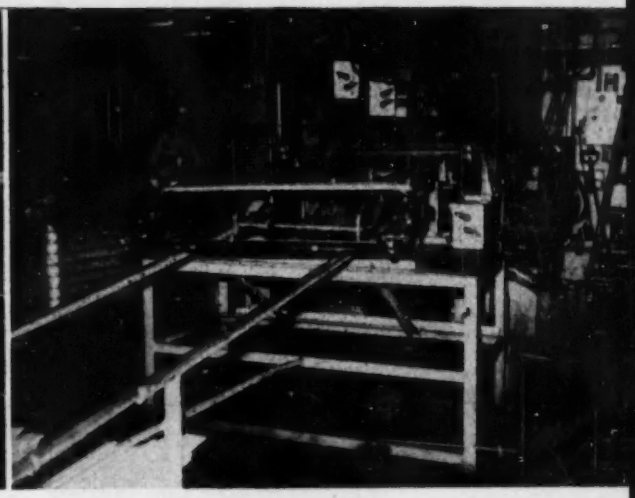


FIG. 3

Here the completed front-seat bottom-frame is automatically ejected down a chute type gravity conveyor.

. . . Front-Seat Bottom-Frame Line

FIG. 2

A worker loads the front-seat bottom-frame side bar onto a shuttle which automatically conveys the part into the press where it is mechanically located for the welding operation.

has four stations and removes the door from the press inside-up and deposits it onto a steel slat conveyor inside-down for removal to the final piercing operation of the molding holes. While several of the loading, unloading and positioning operations along this line are done manually, there is a minimum amount of physical effort involved due to the conveyors which bring the work practically into the presses.

Operations on welding the front-seat bottom-frame assembly are well automated. On this line, the various parts—two side bars and two rear bars—are loaded manually onto conveyorized loading fixtures, Fig. 2. The pieces come together in a press for welding. Front and rear seat bars are loaded at the front of the press while the side bars are brought in from the right and left hand sides of the welding press. All parts converge into the press and are located automatically. The parts receive 16 direct welds and three projection welds. After the seat frame assembly is welded, the unit is automatically unloaded to a slide-type gravity conveyor, Fig. 3. Shuttle type devices are used to automatically place the materials in the press and

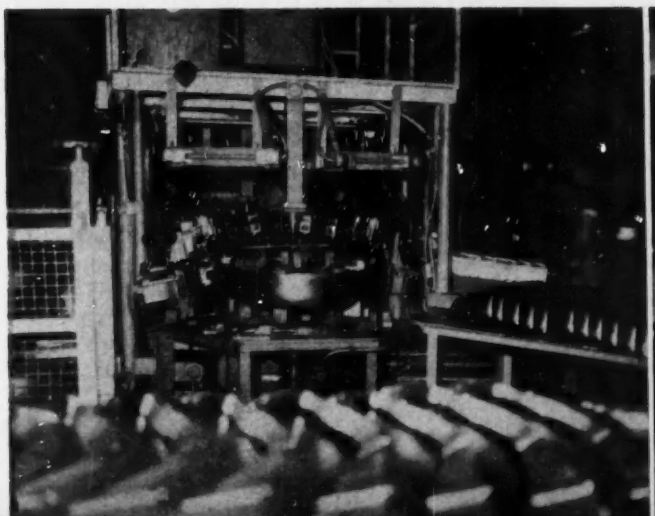
. . . Wheel House Panel Line . . .

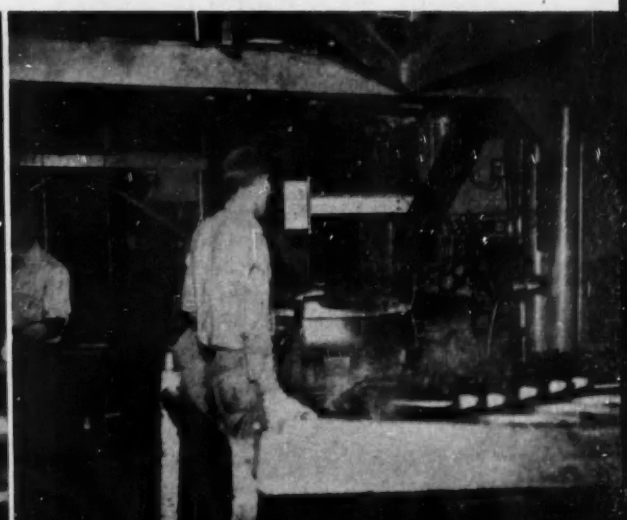
FIG. 4

Eight spot welds are used to tack together the inner and outer wheelhouse panels. This machine utilizes a rotary fixture actuated by a sprocket and chain. Each end of the chain is secured to cylinders which operate the mechanism, as shown under the table of the unit.

FIG. 5

A special rotating table is used in conjunction with a new seam welder for the final operation on the wheelhouse panel assembly.





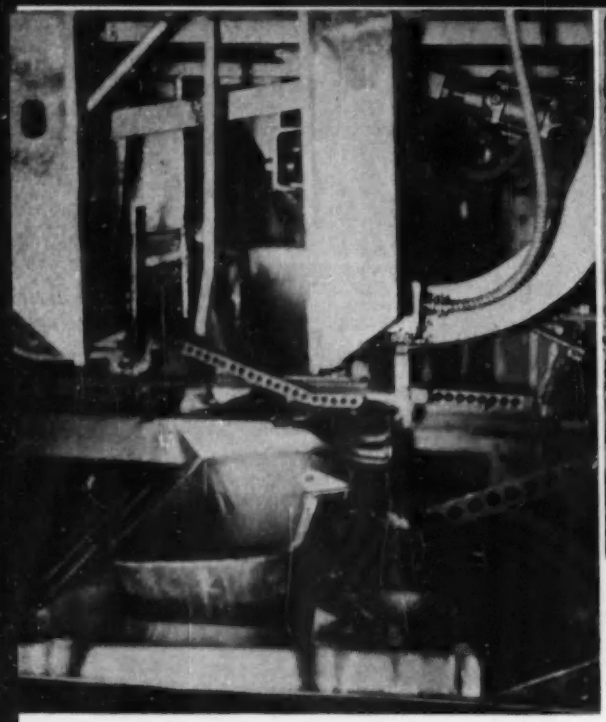


FIG. 6

The spare tire pocket is shown entering the rear compartment floor pan sub-assembly. The operation is completely automated including entrance of the entire part into the next press for welding.

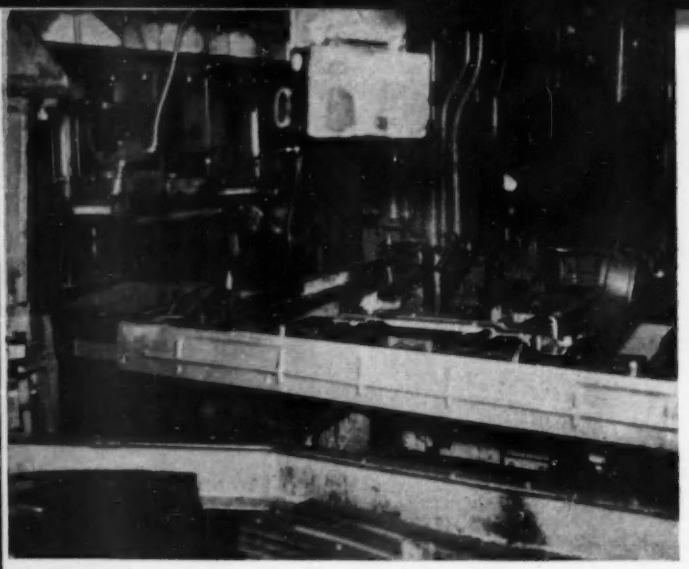


FIG. 7

. . . Floor Pan Line . . .

This automated section of the floor pan line depicts the cross bar and rocker panel inner assembly being fed automatically into a weld press.

position them in the fixture for welding. The finished frame is unloaded by a mechanism which raises the part out of the welding fixture and then ejects it down the gravity conveyor.

There are two interesting automatic welding units used in the assembly of inner and outer wheelhouse panels. Most of the work in this section is transported from station to station by chute type conveyors. When inner and outer wheelhouse sections are initially joined, the operation takes place in a special tack-weld setup equipped with a rotating table. As illustrated in Fig. 4, the welding machine has eight welding heads for the tack-welding manufacturing process. Work is loaded into the fixture manually and then the fixture is automatically rotated and indexed under the welding heads. The rotating mechanism is located under the table—shown in Fig. 4—and consists of a chain and sprocket with each end of the chain attached to separate actuating cylinders. For the final joining phase of the wheelhouse assembly, the workpiece is loaded into an automatic seam welder, shown in Fig. 5. This latest piece of equipment to be installed at the Hamilton plant is fitted with a special rotating fixture so that the operation is completely automatic except for load and unload.

One of the most cleverly conceived welding lines is for the rear compartment pan assembly. The rear compartment pan is brought to the line by means of a chain conveyor; it is unloaded manually to a belt conveyor for operations in a weld press which joins the pan extension to the main sub-assembly. The part is then unloaded and conveyed to another press where the rear crossbar sub-assembly is spot welded to the rear compartment sub-assembly. The crossbar is brought into a third press by means of a shuttle device at right angles to the movement of the rear compartment pan. All work is automatically located in the press for the joining process. The welded pan and crossbar assembly is then automatically unloaded onto an air-operated turnover fixture which deposits the work onto another shuttle. As the rear compartment pan moves along the shuttle, a unique mechanism automatically drops the spare tire pocket into the pan, Fig. 6.

Concerning the spare tire pocket drop, the sheet metal pockets are preloaded as the pan assembly moves along the shuttle conveyor. As the pan hits a limit switch, it drops momentarily and the mechanism holding the tire pocket is released. The tire pocket then falls free into the hold provided in the rear compartment floor plan. The part continues along and is shuttled into a press for further welding operations. After being automatically loaded into the press, the assembly receives 56 to 60 series spot welds—according to the car model being processed—and four direct spot welds. The pan assembly is finally conveyed by means of a shuttle to a press for the finish welding operations of from 48 to 60 spots depending on the model. The completed part is then manually unloaded to a chute conveyor.

Along the welding line for the car floor pans, there are a great many conveyors in addition to automatic loading and unloading fixtures and turnover devices. At the first station in the line, four nuts are projection welded to the seat adjustment anchor plate. The parts are then chuted to a shuttle device. Cross bars welded at the next station are brought to the shuttle by means of a belt conveyor. The entire sub-assembly is auto-

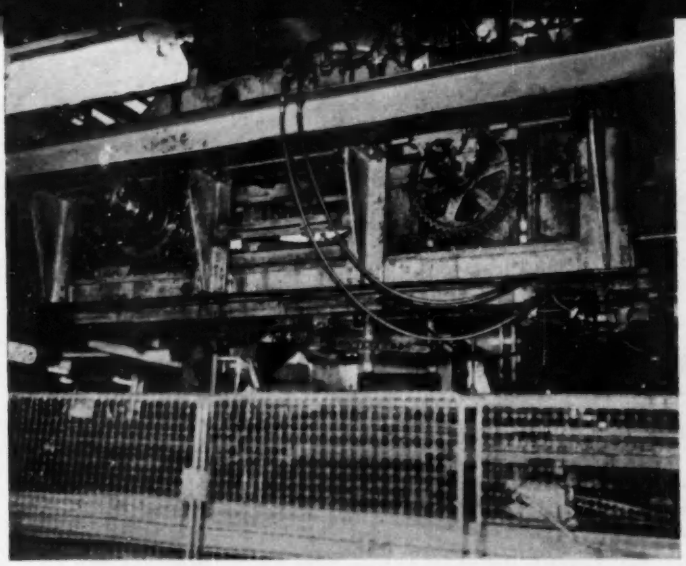


FIG. 8

The drive mechanism for the floor pan line shuttle.

mated into the weld press and then automatically removed. Fig. 7 points out the type of equipment used to automatically convey the crossbars and rocker panel inner assembly into the weld press. Fig. 8 above shows the unit used to drive the floor pan weld line shuttle.

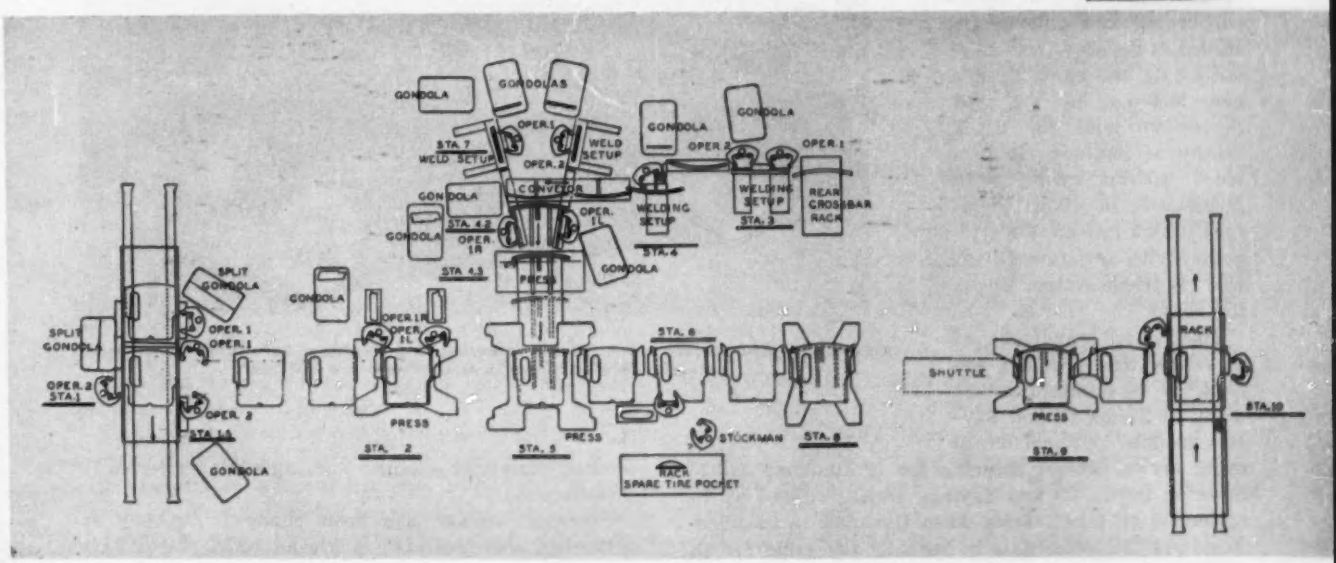
Miscellaneous operations are performed on various floor pan component parts at the next several stations. Most of the floor pan sub-assemblies, excluding the main floor pan, are finally brought together at station 14 on the line. Several of the small parts in the process of being assembled are handled in automated presses connected by means of belt conveyors or chutes to the main assembly artery. At the fourteenth station, these parts are formed into one sub-assembly. The next station, at right angles to the main conveyor, is used for unloading the sheet metal floor pans. In order to move materials handling trucks bringing the material up to the unloading point, an air cylinder is utilized. As the truck is moved into position, a turnover fixture is employed which places the floor pans on a chain conveyor. The conveyor moves the pan up to the main assembly conveyor where the work proceeds to the next press. For this operation, the pan is loaded automatically and reinforcements welded to the pan are fed automatically from two hoppers.

As the work progresses, it is once again loaded into an automated weld press for a total of 72 series spot welds. Again the part is taken from the press automatically and inserted in the next weld press for subsequent operations which consist of more series welding of the same components. This time the part receives 106 spot welds. The operation is repeated at the next station, being fully automated all the way. At the last weld press, Fisher engineers have installed a fixture for not only removing the part from the press but for flipping it over at right angles to the press.

The pan is placed on a chain conveyor by the turnover mechanism for final unloading.

Work flow layout of the rear compartment pan welding line. Sub-assemblies are made up at a right angle to the finish line.

FIG. 9 *Layout of Rear Compartment Pan Welding Line . . .*



The Completely New Buicks

ONE would have to reach far back into the history of the Buick Motor Division of General Motors Corp. to find a period when so many new and basic developments crowded into a model year as they have in the case of the 1954 line.

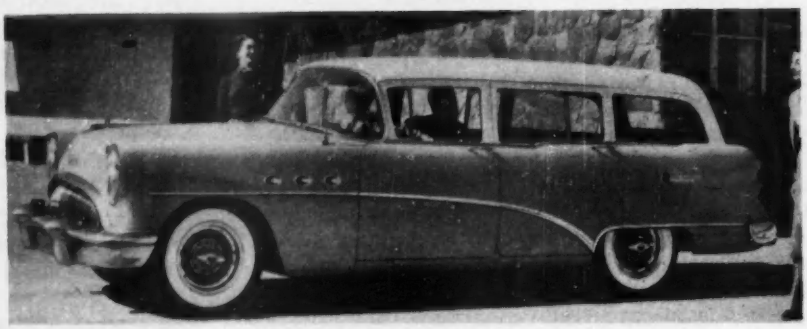
First of the major developments is an entirely new array of bodies—one group for Series 40 and 60 cars; the other for Series 50 and 70 cars. Then there is the introduction of a new Series—the 60—which revives the prewar Century identification. An entirely new Skylark—the M-100—is mounted on a 122-in. wheelbase. A completely redesigned chassis on all models features front end suspension with built-in, direct-acting shock absorbers.

When it comes to engines, the 322 cu in. unit, used last year on Roadmaster and Super models, has a rating of 200 hp with four-barrel carburetor and will be installed in Series 60 and Skylarks. At the same time a new 264 cu in. V-8, for Series 40, joins the Buick family of engines. It provides 150-hp rating with Dynaflow. In 1954, therefore, Buick has all V-8's together with an improved 12-volt electrical system across the board.

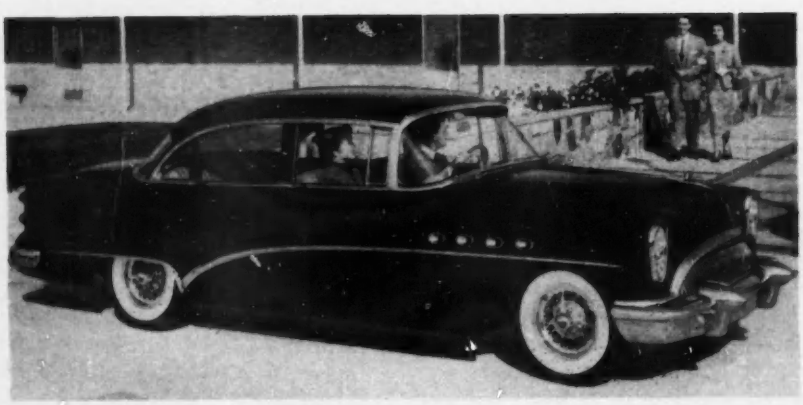
Improved versions of Dynaflow transmissions are supplied as standard equipment on Series 70 and Skylark models; optional on all other series. Power steering too is standard equipment on Series 70 and Skylark series; offered as an option on all other series when Dynaflow is specified. For 1954 the latter unit is basically the same for all models, except for a longer steering shaft on Series 70 installations.

Steering linkage has been changed radically in geometry, with decrease in overall ratio. Tires have

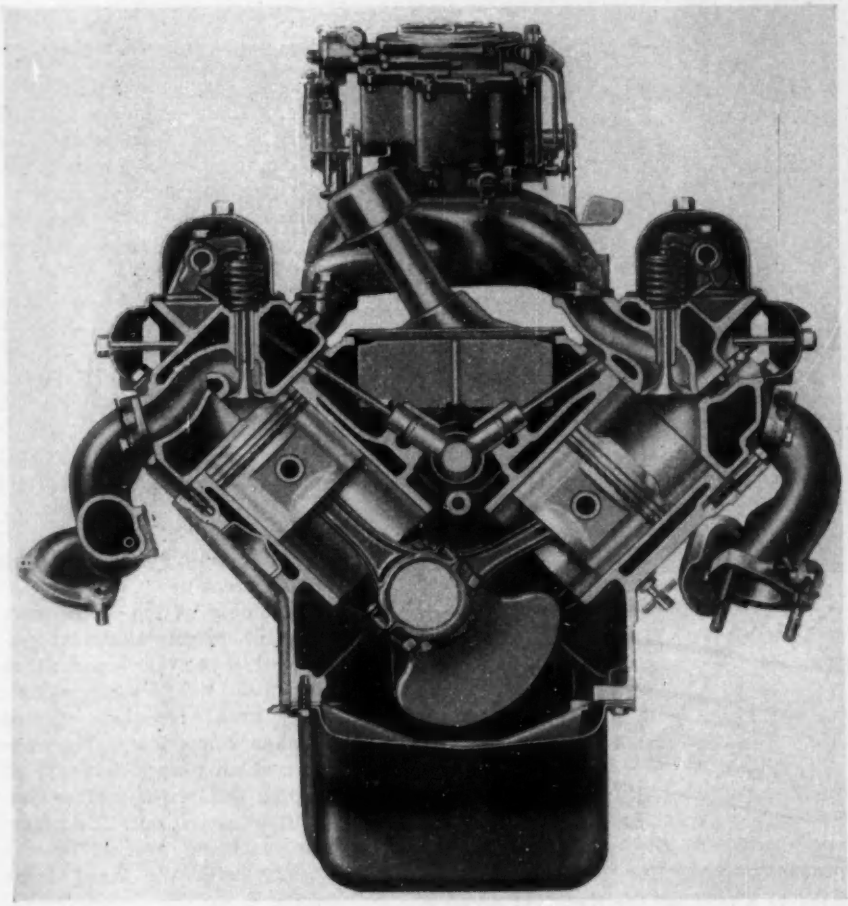
Two-door Super Riviera which is modeled after the Skylark sports car. Among its features are a cut-down belt line and full rear wheel cut-out.



All-metal estate wagon in the new Century series. It is mounted on a 122-in. wheelbase chassis and powered by a 200-hp Roadmaster V-8 engine.



Four-door Roadmaster sedan. Power steering and Dynaflow automatic transmission are standard equipment; wire wheels are optional.



Cutaway view of Buick's new V-8 engine.

been improved. And an evolutionary development in power brakes has been adopted in the form of a power brake vacuum pump added to the system. Since this pump functions at all times engine speed is below 300 rpm and the ignition switch is on, it is capable of supplying full power applications with a dead engine.

Bodies have been restyled on all series, with normal overall height of 60.5 in. on 40 and 60 models. Rear fenders now are integral with the body on all models. The windshield pillar on 40 and 60 Series has a forward slant at the roof, producing an inverted trapezoidal CV panel. On Series 50 and 70, it is nearly vertical and results in a rectangular CV panel. A short sun visor—or cadet visor—effect is developed on Series 50 and 70 sedans (but not 50 and 70 Riviera models) by extending the roof beyond the top of the windshield. One of the most noteworthy features is the introduction of the wrap-around windshield which improves peripheral vision considerably.

All bodies have swing out front door hinges, swing in rear door hinges. In addition, rotary type door locks have been adopted for the 40-60, and M-100 Series bodies. Automatic windows and fore-and-aft and vertical seat adjustment are standard on Models 76C and 76R, with vertical seat adjustment as optional. Series 50 and Model 72R have power operated windows and fore-and-aft seat adjustment as optional equipment. It is of interest that electric actuation is employed on Series 50 and 70 cars, while hydraulic power is used on M-100.

Series 50 and 70 models are mounted on the same chassis, convertible and Riviera wheelbase being upped from 121.5 (in 1953) to 127-in. Series 40 and 60 are mounted on a wheelbase of 122-in. Frames for convertibles in each series are special, featuring additional reinforcements for greater rigidity.

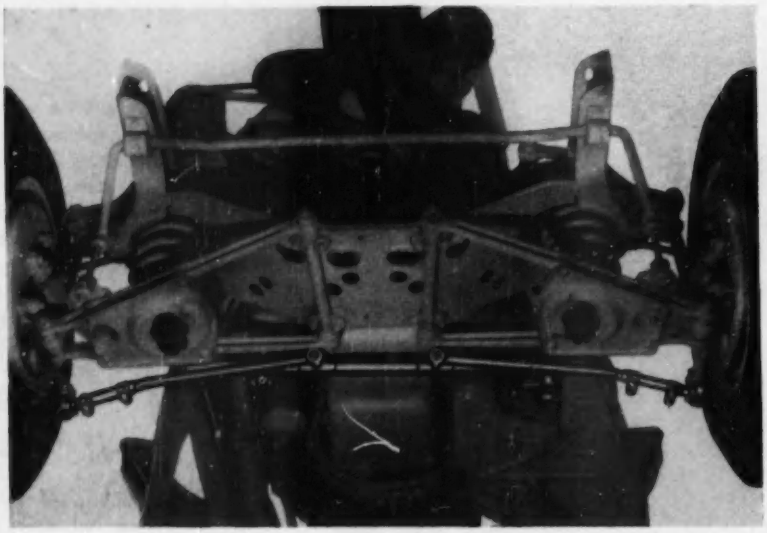
Buick's 322-cu in. 90-deg V-8 engine is found in the Super, Roadmaster, and Century cars, as well as in the Skylark. It has been improved by redesigning the combustion chamber to provide increased volume to surface ratio, yielding increased output and better fuel economy. Intake and exhaust ports have been streamlined. This change has brought with it a new piston with the top of the dome lowered by 0.444 in. to reduce the quench area. The piston skirt has been lengthened nearly ¼ in. The six cast drainage slots around the lower end of the piston at the lower edge of the ring have been eliminated.

The new 264-cu in. 90-deg V-8 engine, replacing the former 263-cu in. 8-inline engine, is similar in basic design to the 322-cu in. engines and has many interchangeable parts. The accompanying table 1 gives brief mechanical specifications for the entire family of Buick engines.

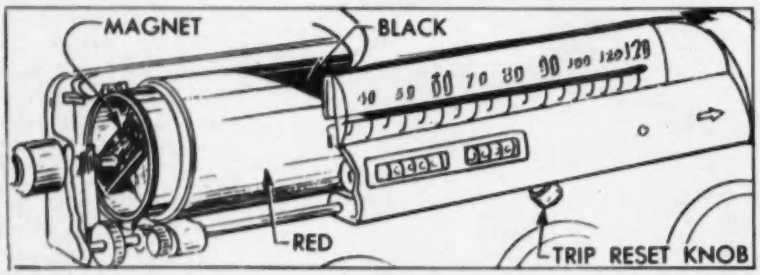
The dual type carburetor is used on Series 40 and 50 engines; while the four-barrel carburetor is installed on Series 60, 70, and M-100. Throttle linkage on Series 40 and 60 is new, the linkage on Series 50 and 70 being a modification of the 1953 system.

In keeping with production economy, the cylinder block for the 264-cu in. engine is similar to that of the 322-cu in. engine, to permit machining over the same transfer machine lines. Chief difference is in the smaller cylinder bore.

Hydraulic valve lifters are standard on all engines



Parallelogram type steering linkage which is used on all 1954 models.



New speedometer which indicates speed by a solid red line that flows across a scale graduated from 0 to 120. A drum, painted black and red, replaces the conventional needle. When the car accelerates, the drum turns up the portion painted red, which makes the line flow across the scale. During deceleration, the drum revolves the other way, causing the line to recede.

CONDENSED ENGINE SPECIFICATIONS

All 90-deg. V-8

	Series 40		Series 50		Series 60 – 70 – M-100	
	Syn.	Dyna.	Syn.	Dyna.	60 Syn.	Dyna.
Bore (in.)	3.625		4.0		4.0	
Stroke (in.)	3.2		3.2		3.2	
Displacement (cu in.)	264		322		322	
Compression Ratio	7.2 to 1	8.1 to 1	8.0 to 1	8.5 to 1	8.0 to 1	8.5 to 1
Bhp (max.)	143 @ 4200 rpm	160 @ 4200 rpm	177 @ 4100 rpm	192 @ 4100 rpm	195 @ 4100 rpm	200 @ 4100 rpm
Torque (lb ft max.)	228 @ 2400 rpm	240 @ 2400 rpm	295 @ 2000 rpm	300 @ 2000 rpm	302 @ 2400 rpm	308 @ 2400 rpm
Gasoline	Regular	Premium	Premium		Premium	
Type Carburetor	Dual-Barrel		Dual-Barrel		4-Barrel	

and are completely interchangeable. A shallower and shorter oil pan is used interchangeably on all engines. The rubber grommet type harmonic balancer, introduced late in 1953 production, is continued on Series 50, 60, and 70 engines.

The piston ring setup on all engines is similar, with compression rings of bevel-taper design, 5/64-in. wide. Oil control rings are of multiple-piece rail type, consisting of four parts—two steel side rails, a corrugated steel spacer, and a spring steel expander—the entire assembly being cemented together with an adhesive that dissolves during engine break-in.

Stemming from experience with the 12-volt electrical system, which now is standard on all Buick V-8's, some notable improvements have been effected in major components. The voltage regulator has a new type of winding and provides more constant voltage output. The generator mounting bracket now is integral with the right front engine mount to reduce vibrations. The starting motor, which has been entirely redesigned, cranks at higher speed with less current draw due to adoption of one shunt field and three series wound fields. This change permits use of a nine-plate battery of lower cost. In addition, the new motor has a helical spline between the armature shaft and clutch and pinion assembly, causing the clutch and pinion assembly to go into complete engagement with the flywheel at each start.

The Twin-Turbine Dynaflow transmission has been slightly modified to suit the new engine as well as frame changes. Major changes are as follows: the rear bearing retainer on Series 50 and 70 is new; the rear bearing retainer on Series 40 and 60 is new, and about 4 13/16 in. longer; the planet carrier assembly on Series 40 and 60 has been slightly modified and lengthened about 4 13/16 in.; the bell hous-

(*Turn to page* 122, *please*)

Clipper DeLuxe club sedan.

Packard Has 212 Hp Engine

PACKARD Motor Car Co. has added a new series of cars to its 1954 models. The new cars are in the Clipper line, and expand the company's coverage of the medium price field with models ranging upward in price from $2500.

The luxury line of Packard will include seven models, ranging from a new deluxe hardtop, the Pacific, a convertible coupe, two family sedans, and an eight passenger executive sedan, to the top of the line custom built Caribbean sports car and a chauffeur-driven model.

Medium priced Clippers will be built in three series. A Super series has been added at the top of the Clipper line, which includes the Panama, a hardtop new to the line, and the Super four-door sedan. Other Clippers are in the DeLuxe and Special series. The DeLuxe series includes a four-door sedan, a club sedan, and the Sportster; a club sedan is designated as a Clipper Special.

Leading mechanical innovation for 1954 is the introduction of a new engine for the Packard line. The new straight-eight delivers greater passing ability at the driving speeds of 40 to 70 miles per hour than any engine Packard has ever built. It has a horsepower rating of 212 and is used in all models except the Cavalier sedan. Piston displacement is 359 cu in., and compression ratio is 8.7 to 1.

There will be a total of four basic engines: a Clipper special, with 150 hp; a Clipper DeLuxe, with 165 hp; the Cavalier engine, with 185 hp; and the Packard engine, 212 hp. Maximum horsepower is reached at

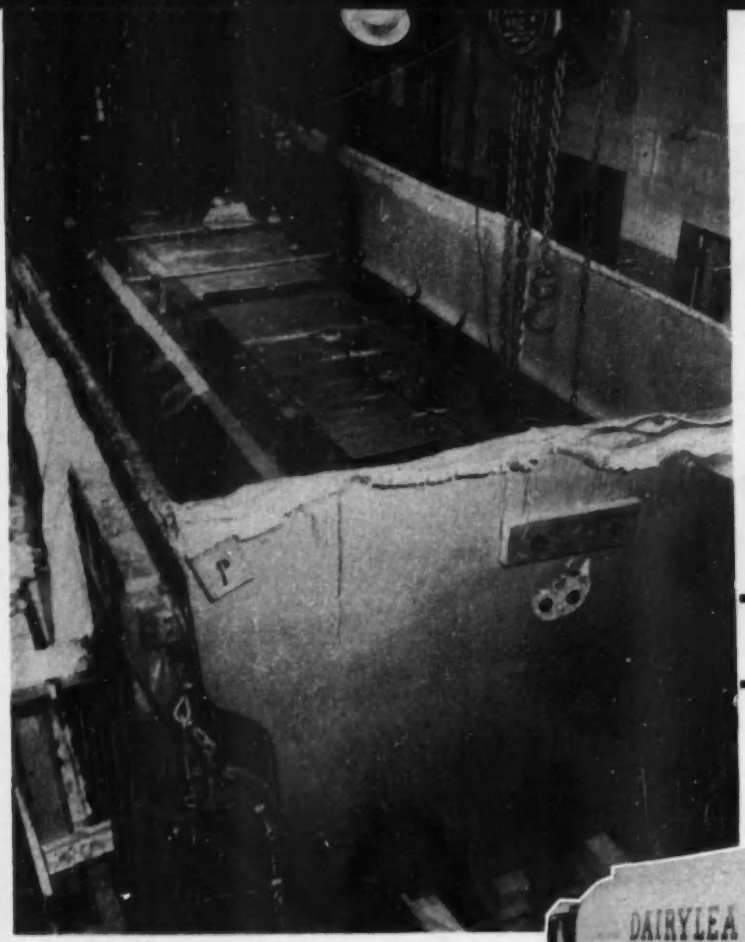
(*Turn to page* 112, *please*)

CONDENSED ENGINE SPECIFICATIONS

	THE PACKARD LINE		THE CLIPPER LINE		
	Patrician Caribbean Pacific Limousine Executive Sedan Convertible	Cavalier	SUPER SERIES Panama 4-Door Sedan	DELUXE SERIES Club Sedan 4-Door Sedan Sportster	SPECIAL SERIES Club Sedan
ENGINE:					
Type			"L" HEAD VERTICAL		
Brake Horsepower	212 @ 4000 rpm	185 @ 4000 rpm	165 @ 3600 rpm	165 @ 3600 rpm	150 @ 4000 rpm
Displacement (cu in.)	359	327	327	327	288
Bore (in.)	3 9/16	3 1/2	3 1/2	3 1/2	3 1/2
Stroke (in.)	4 1/2	4 1/4	4 1/4	4 1/4	3 3/4
Compression Ratio	8.7 to 1	8.0 to 1	8.0 to 1	8.0 to 1	7.70 to 1
Bearings	9	5	5	5	5
Oil Capacity (qts)	7	7	7	7	7
Carburetor	4 barrel down-draft	4 barrel down-draft	dual down draft	dual down draft	dual down draft

Latest Developments in

PLASTIC TRAILERS



BEFORE

AFTER

Shown directly above is installation of running gear sub-structure of single-piece plastic milk tank truck. Tank is upside down and partly out of mold. It emerges complete in one process, including silver finish. Mold is painted before Marco resins are drawn in and paint adheres to resin surface.

Said to be the largest one-piece molding of its kind yet produced, this finished plastic milk tank of Celanese polyester resins is approximately 27 ft long and 58 in. high. It has a circumference of 18 ft and the total weight is only 7000 lb. Overall height of the tank from road bed when mounted on the frame is 105 in.

THE commercial trailer field has proved to be one of the most fruitful areas for the exploration of new uses for reinforced plastics. Highly valued for their light weight, durability, translucency (when unpigmented), and non-corrosive qualities, plastic materials have been used considerably with excellent success as liners for refrigerator trailers, transport tank bodies, structural doors, and skylights in van-type trailers (see AUTOMOTIVE INDUSTRIES, Sept. 15, 1953, page 42).

In recent months, however, a number of new adaptations and production techniques for reinforced plastics in commercial trailer design and construction have appeared on the scene. Many of these new developments have evolved from the experimental efforts of three companies which have been active from the very beginning in finding more and better uses for plastics in trailers.

Seaboard

Although truckers, and not manufacturers, Seaboard Transportation Co. has been experimenting for several months at its Antioch, Calif., plant in the construction and use of glass fiber plastic trailer and truck bodies. All told, the company has built six van-type

trailers, six open-top wood chip trailers, and one single-piece truck body (see cut) of glass fiber and Vibrin polyester resin. It is interesting to note, in this connection, that Seaboard has used ribs of plastic also on these 12 trailer bodies, whereas Strick (see below) still adheres to the use of metal for side posts.

The process is not complicated, once the molds have been designed and built. These are constructed, in the exact size required, of wood, steel, and plastic. The material, consisting of glass cloth and fiber mats, is then worked in these molds by "laying up" the fiber glass cloth and mat, which are cut to rigid specifications.

Once the foregoing is done, the material is saturated with the Vibrin polyester resin, distributed evenly with a squeegee and whisk broom. As this proceeds, the door headers and pre-formed ribs are pressed into the wet "lay-up," ultimately forming a complete body section, the parts of which when cured become one integral unit.

The bodies are made in sections—the sides, roof, front, and floor section. Space at the rear is used for doors, or the doors may be installed at the side. After each section is completely cured, all the sections are assembled and bonded together by resin and mechanical means on the conventional trailer chassis.

Strick

Although it has been engaged for some time in the production of trailers with skylight roofs, interior liners, and doors of reinforced plastic, only rather recently did Strick Co., Philadelphia, go into production of a trailer that is all-plastic except for the aluminum side posts, doors, supports, etc. Intended for special-purpose requirements, such as the hauling of corrosive materials, plastic trailers now account for about seven to eight per cent of the company's total trailer production.

The panels used in the plastic unit are made in a large press and are a combination of cloth, mat, and resin to give maximum strength and impact resistance at minimum cost and weight. Glass fiber and polyester resin are combined at low temperature and low pressure to form the reinforced compound.

The roof panels are less than 1/16 in. thick, while the side panels are 3/32 in., except for a three-ft band at the bottom which is built up to ⅛ in. for additional strength. In the assembly of the trailer, the side panels are riveted to the exterior aluminum posts, and together with a top and bottom aluminum rail, form the load-carrying members of the trailer. Riveted construction is also employed for roof panels in all-plastic roofs and in the skylight roofs.

Dorsey trailers has just announced the use of plastic in roofs also. It has introduced a roof cap of plastic in its 1954 line. (See News Section of this issue.)

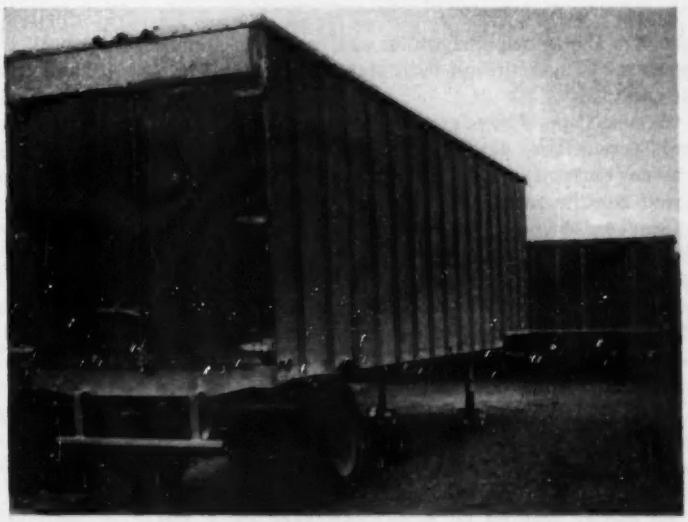
Celanese

A giant step forward in the construction of plastic tank trailers was taken recently by Celanese Corp. of America with the unveiling of a single-piece milk truck tank made of polyester resins with a capacity of over 4000 gal. Insulation Associates, Fanwood, N. J., designed and developed the tank truck under sponsorship of the Dairymen's League. The League intends to place it in service immediately.

The tank was completed by a process known as the

(*Turn to page* 122, *please*)

Three weeks were required for three men to build the mold for this one-piece Seaboard plastic truck body. After the mold has been built, the process is comparatively simple.



A Strick trailer with plastic body panels and roof. The panels of polyester resin and fiber glass are corrosion-resistant and dent-proof. If necessary, the panels can be repaired easily.

Highway Expansion Problems

By Andrew Shearer

THE National Conference on Highway Financing, held Dec. 10-11 in Washington, D. C., under the sponsorship of the Chamber of Commerce of the U. S., brought out into the open a number of views, often conflicting, on the question of how America is to finance sorely needed improvements in roads, streets, and highways. During the two-day affair a wealth of information and evidence was developed on such matters of vital interest to the automotive industries as toll roads, highway user taxation, Federal aid matching, and intergovernmental relations.

The opening panel of the conference was devoted to the subject of the present adequacy of streets and highways, transportation demands, and financing methods and capabilities at different levels of government. Three speakers were called upon to present their viewpoints on these important questions.

The first panel member, G. Albert Hill, Commissioner, Connecticut State Highway Dept., pointed out that the 3.2 million miles of U. S. public roads are estimated to be in need of between $40 and $50 billion worth of improvements. Financing them is a weighty problem the solution of which will require an unusual amount of ingenuity on both state and Federal levels, he said.

James Cope, Chrysler vice-president in charge of public relations, declared that the 5.5 billion which the nation is currently spending on the highway program is quite insufficient and that added to it should at least be the $3 billion which the Automobile Manufacturers Association estimates is wasted by lack of adequate roads. He went on to say that the states should lead the way in correcting the situation, but that Federal aid is an indispensable adjunct.

Mr. Cope expressed the general viewpoint of the automobile industry in regard to two other pertinent matters. First, although the Federal Government has a general obligation toward the development of the nation's highways, it should not be levying user-taxes in any form. Second, while toll roads have their place, they can at best do no more than alleviate a small percentage of the stresses and strains on the highway system. (*Turn to page* 100, *please*)

Automobile Industry Sets New Dollar Volume Record

EMPLOYMENT and payrolls in the U. S. automobile industry set all-time records in 1953, and production of motor vehicles reached the second highest level in history, according to the Automobile Manufacturers Association. Average employment was 930,000, exceeding the previous record set in 1951 by 85,500. Payrolls increased for the sixth straight year, reaching a new peak of $3.5 billions.

The employment figure includes 770,000 production workers, who averaged 40.8 hours of work a week at an average hourly rate of $2.14. Weekly paychecks for production employes averaged $87.38.

U. S. automotive plants turned out an estimated 7,370,000 motor vehicles during the year, a 33 per cent increase over 1952 and consisting of 6,165,000 passenger cars and 1,205,000 trucks and buses.

Defense production accounted for nearly 20 per cent of the industry's 1953 volume, and is expected to continue at a substantial level throughout 1954, despite cutbacks and stretchouts in the Government's military procurement programs.

Wholesale value of motor vehicle production in 1953 hit a new high, estimated at $11.44 billion. Passenger cars accounted for $9.15 billion and trucks and buses for $2.29 billion.

Vehicle registrations increased nearly 1.5 millions during the year to an estimated 54,745,000. Of this total, however, about one-third of all passenger cars and one-fourth of all trucks still are prewar models. Four out of every five new vehicles produced in 1953 merely replaced those scrapped during the year.

Annual mileage by U. S. motor vehicles increased 25 billion miles to a new record of 547.5 trillion during the past year.

Highway expenditures during 1953 reached a total of $5.45 billion. Approximately $3.25 billion went for capital outlays, with $2.2 billion going for maintenance, administrative expenses and interest on highway debts. Total expenditures set a new record, but actual construction and improvement were barely ahead of 1941 performance.

Special motor vehicle taxes hit a record total of $5.7 billions during the year, including $1.5 billions in special truck taxes.

AMA noted only two downward trends in the year's statistics. Even though the number of passenger cars shipped abroad during 1953 increased to 180,000 from 167,000 in 1952, the ratio of exports to total produc-

Preliminary "Automobile Facts and Figures"—1953

Factory Sales	1941	1950	1952	1953 (est.)
Number:				
Passenger Cars	3,779,682	6,665,863	4,320,794	6,165,000
Trucks and Buses	1,060,820	1,337,193	1,218,165	1,205,000
Total	4,840,502	8,003,056	5,538,959	7,370,000
Wholesale Value:				
Passenger Cars	$2,567,206,000	$6,468,137,000	$6,455,114,000	$9,150,000,000
Trucks and Buses	1,069,800,000	1,707,748,000	2,319,789,000	2,290,000,000
Total	$3,637,006,000	$10,175,885,000	$8,774,903,000	$11,440,000,000
Exports—Number				
Passenger Cars	98,124	152,544	167,048	180,000
Trucks and Buses	110,787	150,502	162,538	132,000
Total	208,911	303,046	329,586	312,000
Replacement Parts and Accessories, Domestic Market				
Wholesale Value	$718,212,000	$1,881,700,000	$2,164,300,000	$1,900,000,000
Motor Vehicles Registered, Dec. 31				
Passenger Cars	29,630,000	40,334,000	43,811,000	45,035,000
Trucks	5,099,000	8,638,000	9,244,000	9,460,000
Buses	125,000	224,000	240,000	250,000
Total	34,854,000	49,195,000	53,294,000	54,745,000
Age of Vehicles in Use, Average				
Passenger Cars	5.5 yrs.	7.8 yrs.	6.8 yrs.	6.6 yrs.
Trucks	5.6 yrs.	7.0 yrs.	6.6 yrs.	6.6 yrs.
Gasoline Consumption				
Million Gallons	24,192	35,653	40,585	42,500
Vehicle Mileage				
Million Miles	333,396	458,422	521,741	547,500
Employment in Vehicle Manufacturing				
Production Workers	571,000	701,600	647,100	770,000
All Employees	654,000	825,200	793,500	930,000
Payroll in Vehicle Manufacturing				
Production Workers	$1,239,641,000	$2,672,000,000	$2,794,000,000	$3,500,000,000
Special Taxes on Motor Vehicles				
All Vehicles	$2,185,673,000	$4,359,361,000	$5,305,310,000	$5,725,000,000
Motor Trucks	572,766,000	1,190,754,000	1,479,821,000	1,525,000,000
Highway Expenditures, All Roads and Streets				
Capital Outlay	$825,000,000	$2,308,000,000	$2,913,000,000	$3,243,000,000
Maintenance, Administration, Interest	1,291,000,000	1,844,000,000	2,101,000,000	2,210,000,000
Total	$2,116,000,000	$4,150,000,000	$5,014,000,000	$5,453,000,000

Source: Automobile Manufacturers Assn.

than one million trucks were built by the industry, a mark reached only once prior to WW II.

Suppliers to the industry had one of their biggest years in 1953. For example, glass used in 1953 passenger cars would have supplied all doors and windows for 1,500,000 five - room houses, considerably more than actually constructed that year.

Looking ahead to 1954, the industry finds many encouraging factors. Approximately 12 million prewar cars still are on the highways; 17 million American families do not own automobiles; 37 per cent of the nation's farms are without passenger cars and 66 out of 100 do not have trucks. Of the nation's present car-owning families, only about 10% own more than one.

Today's car buyers also are demanding more "extras" than ever before. Market for automatic transmissions, power steering, power brakes, and air conditioning grows.

Fewer than 115,000 new cars built in 1952 were equipped with power brakes, while the total this year will reach 550,000, AMA reported. In the first nine months of 1953, 600,000 cars were produced with power steering. That was three times the total for all of the previous year.

Automatic transmissions were installed in 2.5 million 1953 passenger cars, and the number should be even higher next year.

tion slipped from 3.9 per cent to 2.9 per cent. Truck exports declined from 162,000 in 1952 to 132,000 and from 13.3 per cent of production to 10.9 per cent.

Although total truck production dipped slightly in 1953, it was the 7th consecutive year in which more

ROCKETS behind the

By George P. Sutton
Aerophysics Department, North American Aviation, Inc.
Downey, Calif.

DATA and clues on rocket activities behind the Iron Curtain have been collected by the author and when examined individually, each piece of information found in American or foreign literature does not reveal any direct trend; however, when all the reports are reviewed as a whole, one can obtain a discernible and definitely disturbing picture of Soviet rocket effort.

Reliable technical information is available on early Russian rocket research which has been reported previously by several historians and will not be reiterated here. This work probably has little influence on today's Russian rocket developments, but it shows clearly that the Russians had a very early start in this field, and that they displayed independent and fertile technical thought. Most notable among early Russian rocket researchers was Professor K. E. Ziolkowsky, who in 1903 proposed a liquid-propellant rocket engine in an article dealing with the possibility of space travel. He was the first to present a mathematical flight theory, and he also proposed oxygen and hydrogen as rocket propellants.

According to German intelligence, during World War II, active rocket research work was carried out by Ziolkowsky and his associates in a suburb of Moscow. When the German Army approached Moscow, this rocket center was abandoned and supposedly was transferred to Sverdlowsk in the Ural Mountains. At this research site the Germans found housing and foundations identifiable with rocket work, but found no rocket components or technical material. These intelligence reports are evidence of organized, systematic rocket research and development by the Russians prior to and during World War II.

The development of rockets, as well as any other complex technical device, requires research facilities and the services of highly trained specialists. The Soviets have made great progress in improving their technical and educational facilities.

It is believed that the Russians have the background, the teachers, and the students for competent rocket research and development. Certainly they demonstrated appreciable accomplishments in World War II.

Solid-Propellant Rockets

During World War II the Russians put in service several types of solid-propellant rockets. In the battle of Stalingrad a new barrage rocket, a new antitank rocket, and new rocket launchers were used in relatively large numbers, and were instrumental in turning the tide of the war against the Germans. It is significant that these rockets were used in the field before solid-propellant rockets were used extensively by our military forces, and that the propellants used by the Russians were basically different from ours.

The brief literature survey which preceded the writing of this article did not yield any significant information concerning recent Russian investigation on solid propellants. However, late Russian scientific publications contain articles on the process-control of ammonium nitrate production. This chemical is known to be a very cheap oxidizing agent for solid propellants, but its use presupposes control of polymorphic transformations. Since ammonium nitrate has many other applications, this work does not necessarily indicate active research on this chemical for use as a solid propellant.

Aircraft Rocket Engines

A number of articles, which appeared recently in various publications, are devoted to the employment of

TABLE I

SOVIET FIGHTER AIRPLANES WHICH HAVE USED AUXILIARY BUILT-IN ROCKETS

Airplane designation	La-37	Yak-21
Designer	Lavochkin	Yakolev
Span, ft	36	31
Length, ft	36	21
Flight Mach number	Close to 1.0	Above 1.0
Gross weight, lb	16,000	12,000

Iron Curtain

Location of Soviet rocket facilities.

auxiliary rockets in Russian military jet-fighter aircraft. These rockets are designed to increase the airplane performance at high altitude and to augment the take-off thrust. During the recent Soviet Aviation Day in Moscow, several fighter - type airplanes were observed which developed smoke trails in flight, possibly from the exhausts of auxiliary rocket engines.

Rocket assistance has been used on two specific swept-wing Soviet airplanes; the La-17 and the Yak-21. Basic data on these airplanes are shown in Table 1. Other Soviet airplanes are reported to have used rocket assistance, but this discussion will be limited to these two.

The rockets which apparently were installed in these two airplanes were auxiliary engines and were used intermittently. A turbojet engine was the principal power plant. Use of the rocket engine permits an improvement in combat capabilities, such as an increase in speed, rate of climb, or maneuverability. This performance gain can be realized only while the rocket engine is operating. As rockets are notoriously poor in their specific fuel consumption, the airplane must carry a heavy weight of rocket propellant in addition to the fixed weight of the rocket installation. Because of this added weight, the airplane suffers a very considerable performance loss when the rocket is inactive. Consequently, there is a reduction in range, endurance, rate of climb, or radius of turn. Therefore, the claims which have been made, that the addition of a rocket improves the range of the airplane, are believed to be wrong.

There is disagreement among the references as to the details of the Russian auxiliary rocket unit. Some maintain it is a refinement of the German Walter 109-509C rocket unit; others claim it is a refinement of the German BMW 109-718 rocket engine. In either case, it is supposedly an improved and advanced version of some original German work. Table 2 shows some of the characteristics of these two units and some guesses (by this and other authors) about advanced versions.

The estimated weights in Table 2 show the extra penalty which must be carried by the airplane for an arbitrary two minutes of rocket operation at 30,000-ft altitude. For example, because the Kostikov unit of 6000-lb thrust is so heavy it is doubtful that serious consideration would ever be given to this unit for use as an auxiliary engine in a turbojet driven airplane. This rocket engine might be used as the principal power plant of an aircraft powered solely by rockets and which has a very short flight range. (*Turn*)

From all the evidence it can be concluded that the Soviets have had in operation some fighter-borne, liquid-propellant auxiliary rocket engines. It may be that their experience has been so discouraging that they have abandoned or delayed the use of auxiliary rockets in fighter airplanes; or perhaps they have developed a highly potent weapon which, in typical Russian fashion, they are saving for the day when they really need it. These fighter-borne, liquid-propellant rocket engines are probably a Russian development, and not simply an extension of German efforts.

One recent source indicates that the Russians are experimenting with vertical take-off and landing of fighter airplanes. The aircraft is stood up on its tail and launched by rocket power. Landing is accomplished by parachute and rocket control. This method of putting fighters into the air has the advantage of eliminating the need for landing fields. Thus, a fighter defense system becomes easy to hide and less vulnerable to bomber attack.

Liquid Propellants

The Russians are reported to have chosen nitric acid and gasoline (or kerosene) as liquid propellants for some aircraft applications. The use of gasoline has the logistic advantage of using essentially the same fuel for the jet engine and the rocket. The Soviets have succeeded in solving the problem of ignition, but still are faced with the difficulty of handling a very corrosive liquid (nitric acid) inside of an airplane, and they undoubtedly have had to develop special techniques and procedures to cope with this problem.

Other sources indicate that research has been done on the combustion of oxygen with benzene and on the spontaneous ignition of aldehydes with oxygen. This interest in oxygen may be connected with their

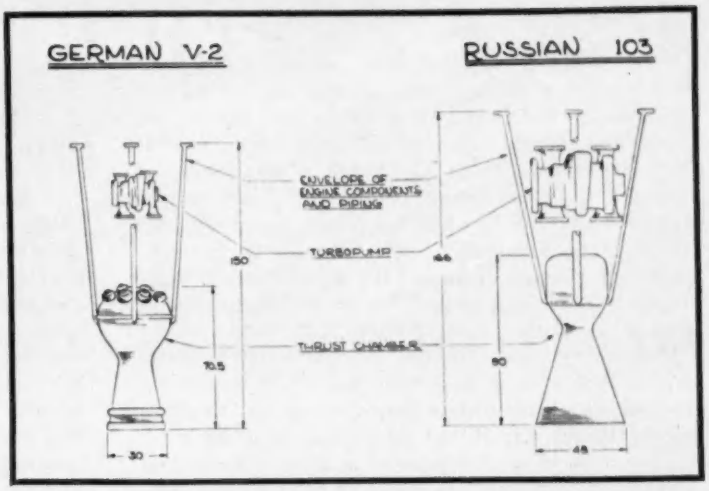
TABLE 2

GERMAN AND POSSIBLE RUSSIAN IMPROVED AUXILIARY ROCKET ENGINES

Unit	German Walter 109-509C	German BMW 109-718	Suggested Improved Walter Unit	Suggested Improved BMW Unit
Manufacturer or designer	H. Walter, Germany	BMW, Germany	Unknown, Russia	Kostikov, Russia
Oxidizer	Hydrogen peroxide	Nitric acid	Hydrogen peroxide	Nitric acid
Fuel	Mixture of alcohol, hydrazine hydrate, and water	50% xylidine, 50% triethylamine	Unknown	Gasoline
Mixture ratio	3.33	3.5	Unknown	Approx. 4
Thrust rating, lb	440 to 3700	2200 (later 2600)	4500	6000
Pump power supply	Gas generator and turbine	Shaft from jet engine	Gas generator and turbine	Gas generator and turbine
Weight of engine, lb	368	115	140 to 250	150 to 240
Propellant required for 2 min, lb	2140	1500	2600	3460
Number of thrust chambers	2	1	1 or 2	1 or 2

In general the improved units are reported to have more thrust than their German predecessors. The use of two rocket thrust chambers indicates a climbing-flight or acceleration-flight phase as well as a cruising-flight phase.

Soviet rocket work, or it may be an extension of the work done by a Russian group on the chemical kinetics of the oxidation of hydrocarbons. Men like Semenoff and Zeldovich pioneered in this field in the early thirties. This work on oxygen, and some fundamental studies on the pumping of low-temperature liquids, indicates that the original German work with liquid oxygen may have been improved by the Russians. For long-range missiles the emphasis definitely seems to have been placed on oxygen and kerosene.



COMPARISON OF GERMAN V-2 AND RUSSIAN 103 ROCKET ENGINE

Thrust at sea level; V-2—56,000 lb; 103—264,000 lb. Chamber pressure; V-2—220 psi; 103—880 psi. Fuel: V-2—alcohol; 103—kerosene. Oxidizer (both engines)—oxygen.

Guided Missiles

At the end of the World War II the Germans, with their development of the C-2 "Wasserfall" antiaircraft missile and their V-2 long-range weapon experience, were far advanced in the field of guided missiles.

Although the United States has obtained many eminent German scientists, the Russians captured almost all of the rocket experimental and production facilities and probably sufficient technical personnel to operate them.

It is known that the Russians activated the German V-2 manufacturing facilities (Mittelwerk, near Nordhausen) and, shortly after the end of World War II, had them in operation at a reduced rate of production. Now, what have they done with all the V-2 missiles which they captured and have produced?

1. They probably have used some for basic scientific explorations, such as upper-atmosphere research, aerodynamic investigations, radiation research, photography developments, parachute tests, and many other studies similar to our operation at White Sands, N. M.

2. They probably have used some to train troops in the operation of guided missiles. The Germans used several hundred V-2 missiles for this purpose before they fired the first missile at England.

3. They probably have used some to investigate improved rocket power plants and new warheads, and thus have laid the foundation for future improved missiles.

4. They could have stockpiled V-2 missiles for a possible future conflict. Some reports indicate that the Russians have made considerable preparation to establish bases from which to launch V-2's in large numbers against European targets.

5. They could have used some for developing a V-2 of improved accuracy, higher payload, or longer range. This could imply increasing the specific thrust above the original sea-level value of 203 sec, or increasing the thrust of the rocket above the original sea-level design value of 56,000 lb. Some of the oxygen research work reported above indicates possible improvement of this type and one private communication from German sources indicates that the Russians are working on an improved V-2 missile engine with a 77,000-lb thrust.

No matter which of these five uses they chose, they have undoubtedly profited from the experience and from having a ready-made production line fall into their hands. The V-2 has provided them with missile production knowledge and with a weapon which can deliver a warhead of 2200 lb in a range of 220 miles (or more if they have improved the missile).

TABLE 3

RUSSIAN LONG-RANGE TWO-STAGE MISSILE

Range (eventual ultimate goal), km	3000 (1865 miles)
Probable gross weight, lb	150,000 to 175,000
Second-stage type	Modified German V-2
Second-stage thrust, metric tons	35 (77,000 lb)
First-stage type	New Russian design
First-stage thrust, metric tons	120 (264,000 lb)
Chamber pressure, atm	60 (882 psi)
Rocket-engine weight, lb	Under 6600
Specific impulse (sea level), sec	240
Oxidizer	Liquid oxygen
Fuel	Kerosene

A recent report claims that missiles have been launched at Kohlberg (near Stettin, Germany) and directed at the Island of Ezel, in the Baltic Sea, which is approximately 400 miles from Kohlberg. If this report is correct, the V-2 has been improved significantly. The Germans had tested a few winged versions of the V-2, which supposedly were designed for over 400-mile range. It is possible that the reported long-range weapon of the Russians is a winged version of the V-2 (called A-9 by the Germans), or that it is a more highly powered V-2 without wings.

The German C-2 "Wasserfall" guided antiaircraft missile is another weapon which fell into Soviet hands. It was almost completely developed by the Germans during World War II, but lacked a satisfactory guidance system. Several completed missiles and the pilot plant for this missile are known to be in Russian possession. It is more than likely that they have worked out a guidance and control system in the last seven years, and that they are producing this C-2 missile or an advanced version.

A German source reports three other new missile developments. Two of these are large missiles requiring high-thrust rocket engines. The first is a two-stage, long-range missile, with an ultimate range of 3000 kilometers. Data on this development are given in Table 3.

The second is a single-stage, winged missile which uses the same rocket power plant. The rocket engine is interesting and unusual, because the thrust is higher than any other previous value published in the literature and because chamber pressure is high for conventional rocket practice. Since the propellants are supposedly liquid oxygen and kerosene, this development is not merely a straight extension of German V-2 work, for the Germans used alcohol as a fuel. The development work supposedly was conducted in part at Khimki near Moscow.

The third new development is a small tactical missile with a range of 35 to 40 miles. It has a thrust of 17,600 lb.

(*Turn to page* 110, *please*)

TABLE 4

SUMMARY OF IMPORTANT RUSSIAN ROCKET DEVELOPMENTS

Rocket Type	Thrust, lb	Duration, min	Application	Status (1952)
Aircraft auxiliary engine (liquid propellants)	2000 to 6000	1 to 3	Assisted take-off and super-performance of fighter aircraft	Some German units flight-tested prior to 1948. Advanced designed probably developed since 1948.
Pressurized liquid propellant rocket.....	10,000 to 20,000	0.5 to 1	Antiaircraft missile	Improved German C-2 (Wasserfall) probably in production.
Liquid-propellant high-thrust engine...	56,000 to 77,000	1	V-2 type guided missile	V-2 was in production following World War II. Improved model probably now in production.
Liquid-propellant high-thrust engine.....	264,000	1 plus	1. Single-stage ballistic missile 2. Long-range (1300 miles) two-stage missile 3. Planned for use in satellite vehicle	Engine currently under development.
Solid-propellant rocket.....	Unknown	Unknown	1. Assisted take-off 2. Aircraft armament rocket 3. Antitank rocket 4. Barrage rocket	Unknown; probably fully developed.
Medium-thrust rocket engine.....	17,600	Less than 1	Short-range (60 miles) missile	Possibly a modified version of the Wasserfall missile, a miniature version of the V-2. Probably fairly well developed.

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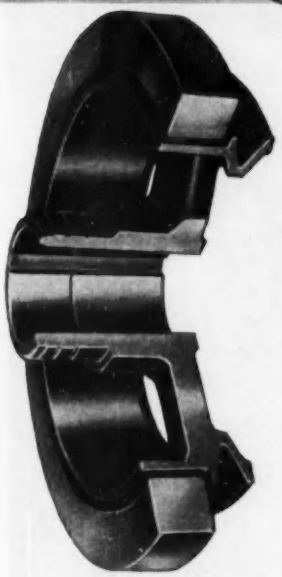

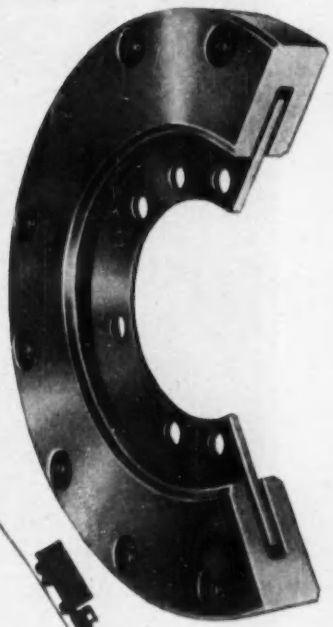

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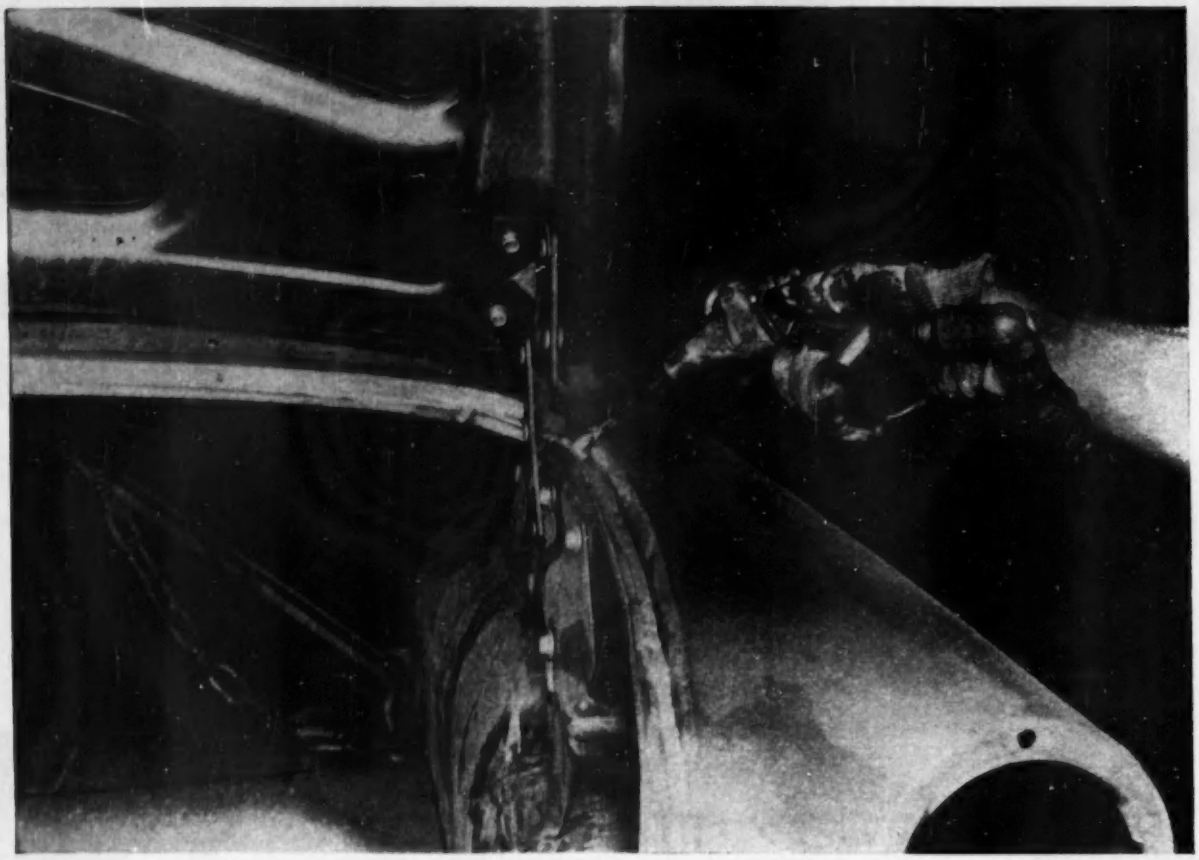

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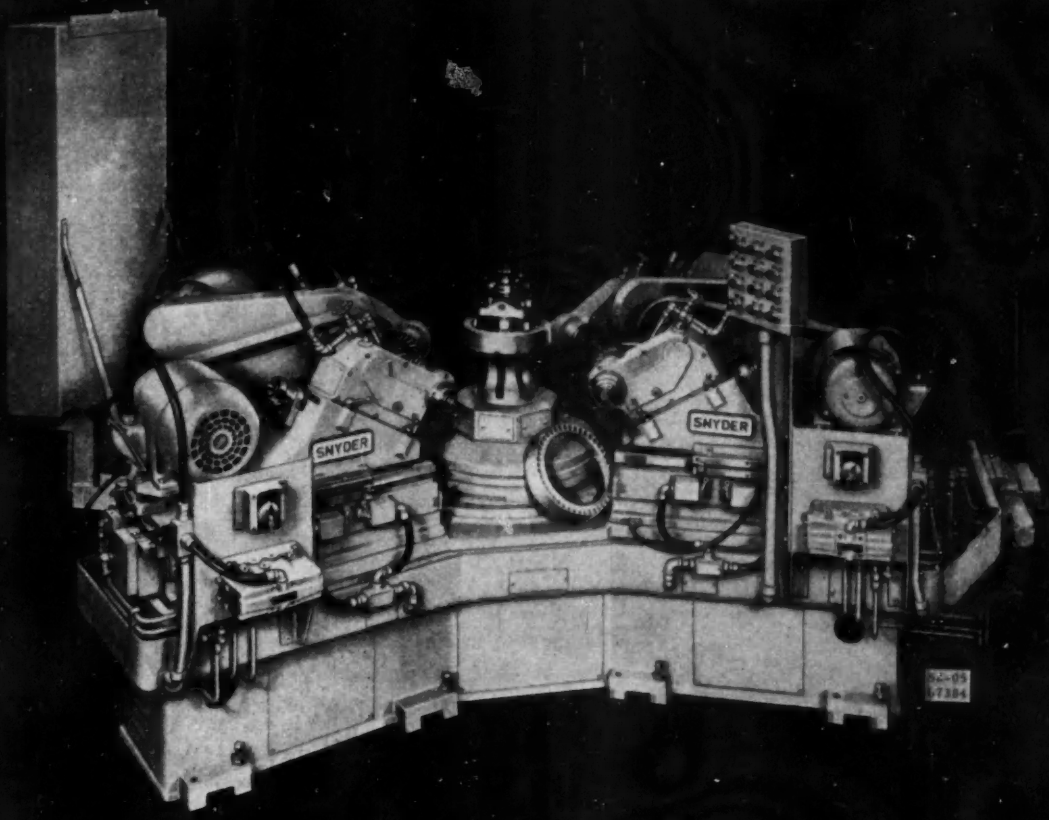

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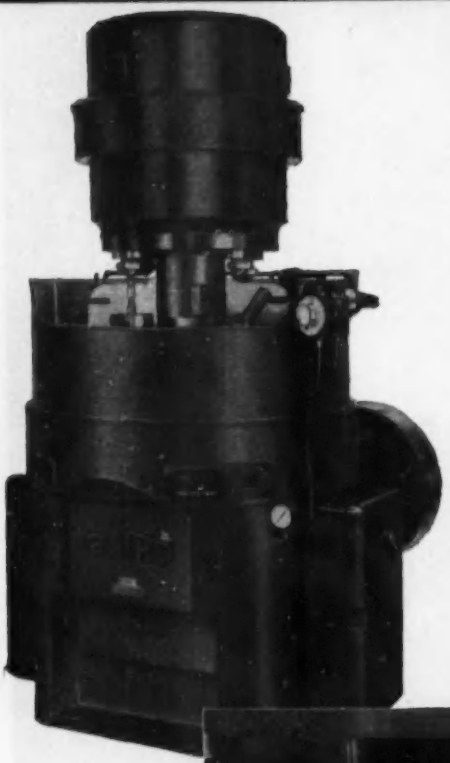

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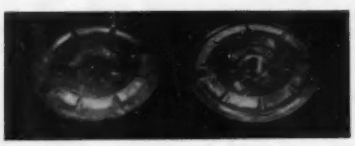

BEFORE AND AFTER

(Above) Front view, showing splash guards for wet cutting.

(Right) Tooling set-up for finishing a generator end plate.

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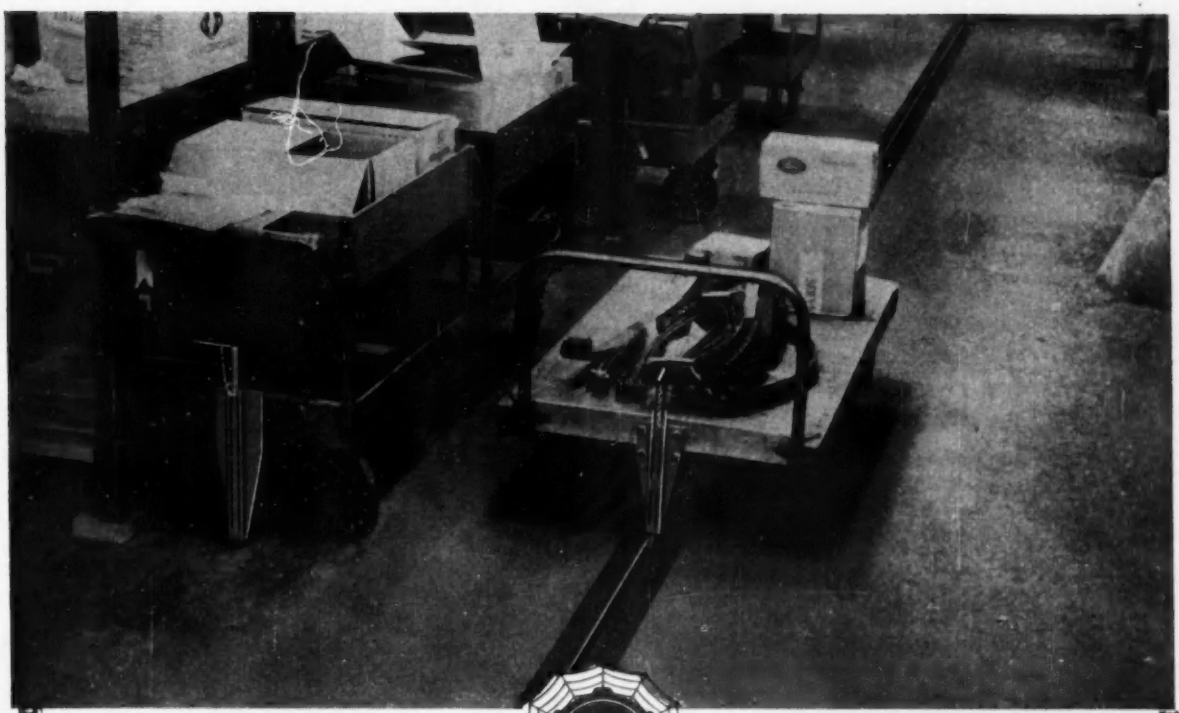

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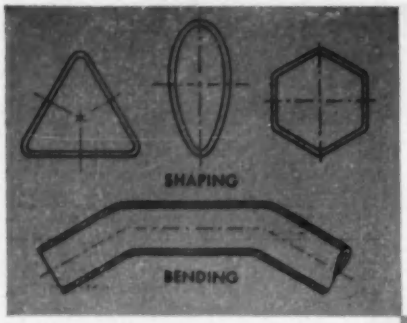

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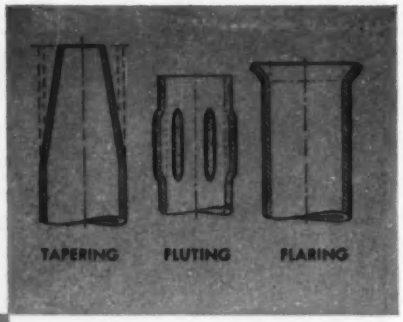

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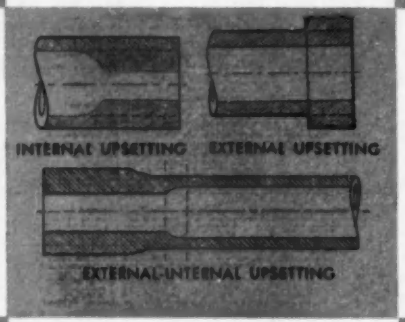
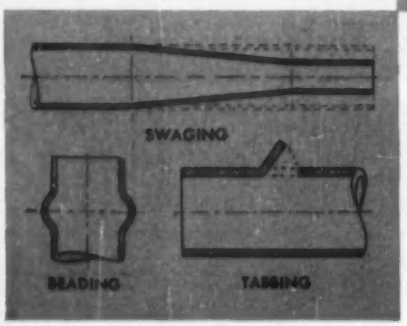
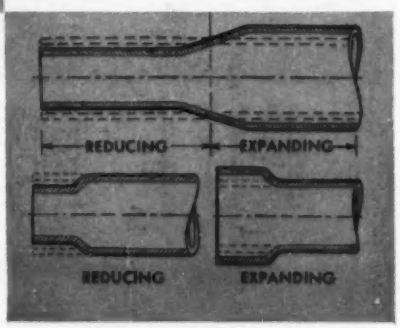


OSTUCO TUBING is versatile!



OSTUCO TUBING is versatile!



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METALS

Lower Price for Copper Foreseen. Tin Stabilizing Pact Drawn Up. Expansion of Aluminum Production Postponed.

By William F. Boericke

Steel Ingot Rate Likely to Decline Further

Steel making operations dropped to 86 per cent of rated capacity in the middle of December, with indications that they would be even lower at the year end. Prospects for January business are not exciting and the month may prove to be the poorest in the first quarter. A pick-up is confidently expected in February and March.

It now appears that inventory trimming will take much longer than was initially expected. Excess inventories are being worked off with exasperating slowness. Buyers have been hesitant over placing orders far ahead, being confident there will be no lack of steel, and believing that price concessions may be made to fill order books. Unlike conditions six months ago, price is now more important than speedy delivery. Freight costs are of prime importance and freight absorption by the mills is nearly universal. Republic Steel instituted a new method of quoting delivered base prices on finished steel, with the published base price including freight cost from each of its five mills. It saves a lot of tedious calculation for buyers.

Demand is Off for Alloy Steel

Much of the decline in overall steel operations has been caused by the pronounced slump in the electric furnace ingot rate which fell to 56 per cent of capacity in December while open hearth furnaces were operating close to 100 per cent. Several factors are cited for the poor showing by the former. No one is interested in expensive conversion steel, demand for alloy and stainless is at low ebb, and military needs have been cut because of the stretch-out program. There seems to be little doubt either that electric furnace capacity, now over 10.2 million tons, has been increased too fast since 1947.

Steel Scrap Prices Weaken After Recovery

The encouragement felt in the steel trade from the rise in steel scrap prices to $38 per ton in November was short-lived. By the end of the month prices had sunk to $34.83 (*Iron Age* composite price) and the decline continued to $32 by the middle of December. Steel scrap continues to mount in mill yards. The action of the steel scrap market, generally regarded as a good barometer for steel mill activity, appears to forecast a further decline in steel output.

Steel Mills Hopeful For Heavy Orders From Detroit

Still in good demand are wide flanged structural shapes and oil country goods. Steel men are banking on a big demand from Detroit in the first half of 1954 and a very heavy output is scheduled for the first quarter by the Big Three. The automotive plants are steel's largest customer. If the optimistic forecasts of good, if not record, motor vehicle output are fulfilled, steel making rates could snap back quickly.

Production of tin plate has been curtailed because of the strike at the plants of the two largest metal container manufacturers. A heavy demand should follow the end of the work tie-up and improved prices for tin plate would not be surprising.

Chile to Sell Current Copper Production At World Price

Developments in the copper industry have been highlighted by a decision of the Chilean Senate to sell surplus copper to the U. S. for its stockpile and, more important, to sell the current production at the world market price on a competitive basis. The Central Bank of Chile will continue to act as selling agent. The government instructed the bank to sell the metal on hand, estimated in excess of 125,000 tons, at 30 cents per lb.

Thus a showdown on the world price, which has been maintained at 29½-30 cents per lb, will shortly come with the impact of 30,000 tons a month of new Chilean copper on a market that to date has managed to get along quite well without this added supply. There is general agreement in the trade that this will result in a lower price. The first test will come when custom firms and big producers begin to market copper for January delivery.

How much and how rapidly the price will drop is a hotly debated question. Most observers believe the decline will be orderly and the market will hold around 26 to 30 cents. Others are more pessimistic and some have set a price of 20-24 cents per lb before the market steadies.

Some confirmation of forthcoming price weakness in electrolytic metal is seen in easier prices for copper scrap which have dropped 1-1½ cents per lb since the Chilean announcement was made.

(*Turn to page 94, please*)

News of the MACHINERY INDUSTRIES

By Thomas Mac New

National Electrical Mfrs. Assn. Issues Report on Causes of Rise in Imports of Electrical Equipment into the United States.

NEMA Studies Foreign Trade

Just last month, the National Electrical Manufacturers Association released a report on foreign trade which was made for the use of NEMA members or product groups of NEMA members. Research for the report was performed by the National Industrial Conference Board under the direction of Martin R. Gainsbrugh, chief economist of the Board.

In summing up the 240 page survey, entitled "The United States and Its Foreign Trade Position—The Electrical Manufacturing Industry," Mr. Gainsbrugh brought out three salient points. The first of these was that many foreign countries have shown a remarkable improvement in their dollar position, and some now have a dollar surplus. During the year ended June 30, 1953, for the first time since pre WW II days U. S. imports substantially exceeded U. S. exports for which we were paid.

The second point was that labor costs in Europe offset U. S. productivity in some product classes. Mr. Gainsbrugh showed that in 1952 total monetary hourly wages and wage supplements of the nations covered in the survey ranged between 10 per cent of U. S. wages and supplements in Japan to 33.0 per cent in Belgium and Sweden. In 1938, the range was from 7.3 per cent in Japan to 46.6 per cent in Germany.

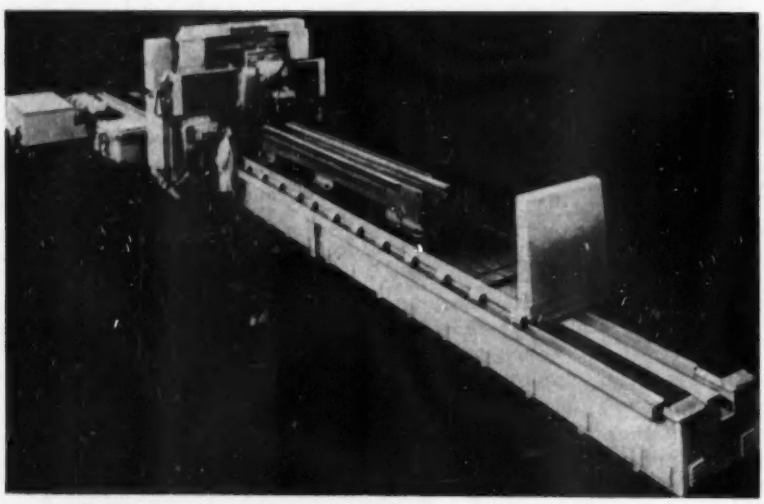
Mr. Gainsbrugh in citing the third point stated that there have been increasing obstacles encountered by the U. S. in trade abroad. In all foreign countries, duties on imports produce much larger percentages of their respective total revenues than they do in the U. S. Foreign nations obtain their tax receipts primarily from general sales taxes or excises which importers into these countries must absorb in addition to their own income tax costs. As a comparative measure, income taxes in the U. S. produce 71 per cent of total tax revenue while of the nations surveyed no nation obtained more than 49 per cent of its total revenue through income levies. Therefore, foreign competitors selling into the U. S. or third markets have sharply lower tax burdens to bear than American competitors regardless of market.

J. H. Jewell, president, NEMA, stated that the survey was performed to show the trend of foreign trade and emphasized that NEMA as an association has not taken any position to date as to a foreign trade policy. He also brought out that the report has been presented to the Federal Commission on Foreign Economic policy, headed by Clarence B. Randall.

The report stated that the rise of foreign electrical sales in this country in the first six months of 1953 was particularly sharp, running 50 per cent ahead of 1952. U. S. sales of electrical goods abroad in the same period rose only nine per cent, and actually dropped seven per cent if sales to Canada are excluded.

World's Largest

In the Monarch Machine Tool plant in Sidney, Ohio, the Thompson Grinder Co. has installed what is said to be the world's largest surface grinder. It was designed to precision grind lathe bedways up to 32 ft long and to a tolerance of 0.0005 in. over the entire length of the way. Overall length of the machine, shown in the accompanying illustration, is 79 ft; and it is 13 ft high and 13½ ft wide. A total of 160 hp is used to power the huge machine which weighs approximately 110 tons. (*Note illustration.*)



This huge grinder, said to be the world's largest, was recently installed at the Monarch Machine Tool Co. plant by the Thompson Grinder Co. It will be used to grind the bedways of lathes up to 32 ft long.

Pines Completes Modernization

Pines Engineering Co. held an open house drawing more than 400 industrialists, at its Aurora, Ill., plant recently to show the completion of the extensive modernization and improvement program started early in 1952. Although not revealing details, Pine's engineers hinted at an entirely new method of accurately controlling the outer wall thickness of tubing when forming various angles of bends to close radii. A new machine was unveiled which promises production savings of up to 50 per cent on such jobs as automotive exhaust and tail pipe

(*Turn to page 94, please*)

NEW EQUIPMENT PLANT • PRODUCTION

FOR ADDITIONAL INFORMATION, please use postage-free reply card on PAGE 89

Single Cycle for Grinding Several Diameters

Type CM-1 heavy duty semi-automatic multi-wheel grinder handles parts having multiple diameters, such as transmission and motor shafts and the line bearings of crank and camshafts, simultaneously in a single automatic plunge-grind cycle. This cycle, in addition to the advantages of minimizing operating duties, assures consistency in the high output rate by performing all grinding operations within a predetermined time.

The wide-span, multiple-cutting capacity of the machine comes from the design of the wheel spindle unit. The heavy wheel spindle has a body diameter of 12 in., and is supported at each end in cartridge type bearings.

Multiple wheels, 36 in. in diameter, are carried on the spindle body between bearings to a maximum overall span of 30 in., including spacing collars. Heavy proportions throughout the wheel head, which moves on widely spaced 74 in. long ways, contribute to fast grinding action, fine finish and excellent wheel life.

The cartridge type bearings which support the wheel spindle facilitate grinding wheel changes. Wheel spindle and its bearings are removed as a unit. There is no disturbing of bearing adjustments. Wheel change is further facilitated by a mechanical device which swings back the combined wheel guard and wheel drive motor mount.

A hydraulically operated wheel truing device is mounted on the wheel slide at the rear of the wheel guard and consists of individual truing units for each grinding wheel. A diamond in each truing head is preset to a master gage and truing of all wheels is done simultaneously as the truing device is hydraulically traversed a distance equal to the widest wheel in the setup.

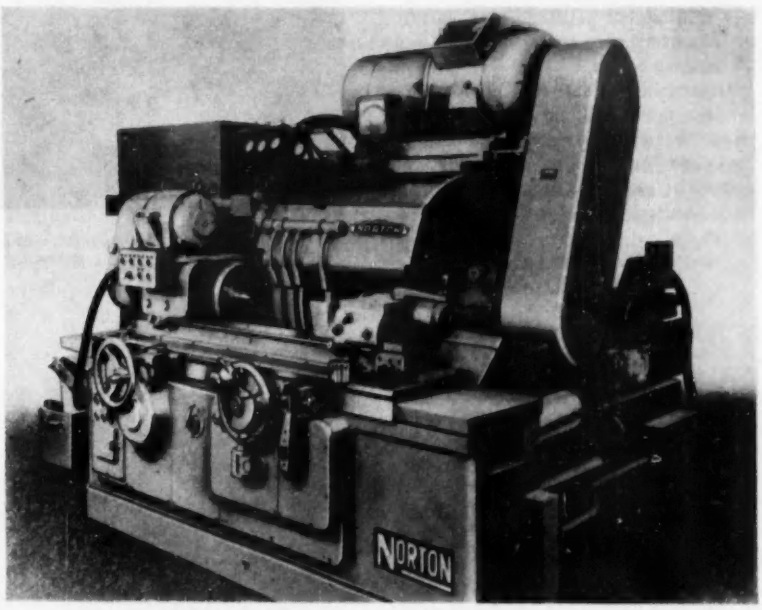
Compensation for wheel diameter reduction is automatic. The wheels are adjusted forward automatically toward the work the same distance as the diamonds are fed into the wheels during truing. Compensation for variation in individual diamond wear is accomplished by push button control for feeding the truing heads individually towards the wheels before re-truing.

The entire wheel truing operation is automatic and is initiated by the operator, or the cycle may be so arranged as to operate the truing device at predetermined frequencies. Automatic operation of the truing device also permits the device to be mounted at the rear of the grinding wheels, completely out of the way of the operator and the grinding operation.

The automatic grinding cycle includes work and coolant control, rapid wheel head advance, grinding feed, dwell and rapid return. The cycle operates under electrically timed control, but a selector switch for optional manual control is provided.

Hydraulically operated steadyrests support the workpiece during grinding where needed. Their action is interlocked with the automatic grinding cycle.

The machine has been designed to permit automation arrangements when desired. A built-in swarf remover is also available at extra cost. *Norton Co.*



The Norton type CM-1 multi-wheel grinder for multiple diameters.

Circle 66 on page 89 for more data

H-D Carbide

A heavy-duty steel cutting grade cemented carbide that steps up machining operations as much as 30 per cent was announced recently. Grade 370 cemented carbide was specially developed for taking heavy cuts at higher tool temperatures. It is the first grade in an entirely new carbide series. It resists cutting edge deformation even at temperatures of 1800 F. *Carboloy Dept., General Electric Co.*

Circle 67 on page 89 for more data

NEW EQUIPMENT — PLANT • PRODUCTION

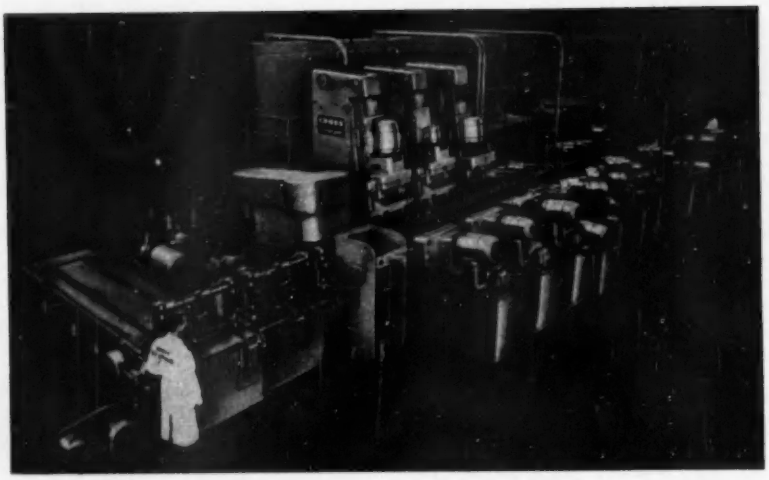
For additional information, please use postage-free reply card on page 89

One Hundred Operations on Manifolds

A new special machine tool of the Transfer-matic type, capable of machining two parts at one time, has fourteen stations—twelve for working, one for loading and one for unloading. It machines intake manifolds at the rate of 206 per hour, performing 100 operations. Two of these are milling, 48 drilling, four boring, 20 chamfering, four spotfacing and 22 tapping.

Outstanding features include palletized work holding fixtures with power wrenches for automatic clamping, and an integral conveyor for automatic return of palletized fixtures from unloading to loading station. *Cross Co.*

Circle 68 on page 89 for more data



This Transfer-matic has automatic chip removal, hardened and ground ways and an automatic lubrication system.

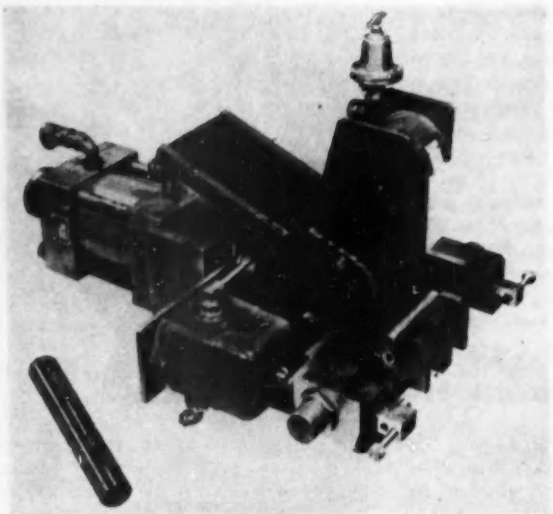
Loaders Feed to Broaches

Red Ring automatic loaders for single ram vertical surface broaching machines are particularly adapted to the handling of round parts on which flats, slots or ends are broached in single ram machines.

The loaders have magazine feed arrangements that work in conjunction with a hydraulic cylinder powered load and unload mechanism. The 1000 psi hydraulic control cylinder is flange mounted at the rear of the loaders and is operated by an air booster. A standard air line source will operate the boosters.

The loader shown positions two ⅞-in. diam, 6 in. long automatic transmission control rods in front of a broach on a single ram vertical machine where two slots and one end are finished by the broaching process, at the rate of 650 rods per hour.

Parts are loaded on the magazine between side rails. With the vise jaws retracted, two parts drop into position, one above the other in the jaws. Then the jaws are pushed forward against a stop by the cylinder, and the air booster applies high clamping pressure.



A transmission control rod on which two slots and one end are broached is at the lower left of the photograph.

The resulting pressure buildup in the hydraulic cylinder causes a sequence valve to initiate the broaching machine ram downstroke, broaching two flats and the end of each part simultaneously. When the ram reaches the bottom of the stroke, high clamping pressure is released and the ram returns to the top of the stroke.

Two unloading dogs on the top of the broach holder grip the two parts and carry them up out of the vise jaws. A curved chute at the top of the loader picks off the parts from the unloading dogs and they slide out on an angular chute into a container. When the finished work is lifted clear of the vise, the vise retracts in position to receive two more pieces from the feed magazine. *National Broach & Machine Co.*

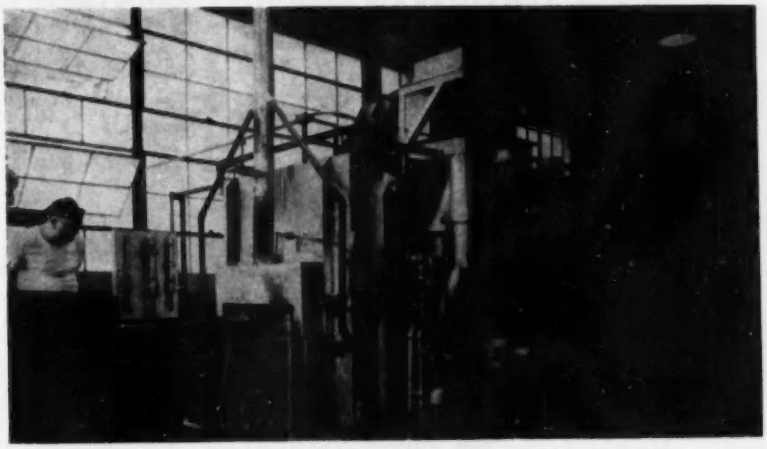
Circle 69 on page 89 for more data

Small Parts Hardened in Shaker Hearth Furnace

Small, light-weight parts can be continuously hardened in a radiant tube, gas-fired shaker hearth furnace now available. It has a maximum operating temperature of 1700 F and is designed for heat treating medium-carbon, high-carbon, and alloy steels without scale or decarburization in an Endogas atmosphere.

In operation, work is loaded on the hearth at the front of the furnace and the reciprocal motion of the shaker charger conveys the parts through the heating chamber until they fall off the discharge end of the hearth into the quenching fluid. The parts are then automatically conveyed from the quench tank on a mesh belt and discharged into tote baskets. The shaker mechanism is mounted on a separate stand so that the furnace receives no shock from the oscillation of the hearth.

The estimated production for this furnace at 1600 F operating temperature is 400 to 600 lb per hour. The speed of the work through the furnace is adjusted by varying the operating ratio of the speed reducer which, in turn, varies the frequency of oscillation of the hearth.



The Westinghouse small-parts shaker hearth furnace in operation.

Charge space of the hardening zone of the furnace is 30 in. wide, 84 in. long, and 3 in. high. Radiant tubes are installed over and under the shaker hearth and are fired from the same side of the furnace.

Typical applications include the hardening of small flat springs, screws, bolts and other small hardware. Parts which are round or which will roll *en masse* are not suitably conveyed by the shaker hearth.

The furnace can also be supplied with electrical heating elements for installations where this type of power is more readily available. *Westinghouse Electric Corp.*

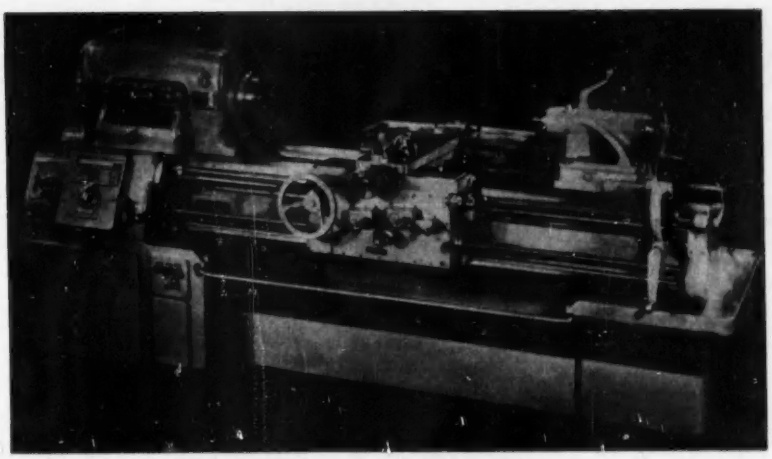
Circle 70 on page 89 for more data

Series 61 Lathe

Providing power rapid traverse and other design refinements and construction improvements for precision performance under continuous, heavy-duty service conditions, the Series 61 line of engine and toolmaker's lathes has been developed. The new models are available in 13 in., 16 in., and 20 in. sizes. They incorporate, in a full range of swings, built-in apron-controlled power rapid traverse to the carriage and cross slide. Tool adjustment time on most work is said to be reduced by about 50 per cent.

Longitudinal movement, right or left, is 160 in. per minute; and cross-movement, in or out, is 75 in. per minute. A safety clutch is provided for all traverse movements, which disengage automatically if they jam accidentally. Another feature is a direct-length reading dial which, built into the apron, facilitates multiple diameter turning and blind hole boring.

Other noteworthy design and construction features of these improved lathes include totally-enclosed gear box and end gearing, automatic pressure lubrication, anti-friction bearings, helical-geared headstock utilizing ground or shaved gears, American standard Camlock spindle nose, flame-hardened and precision-ground integral bedways, and all critical parts made of hardened alloy steel.



The 16-in. series 61 lathe by Monarch.

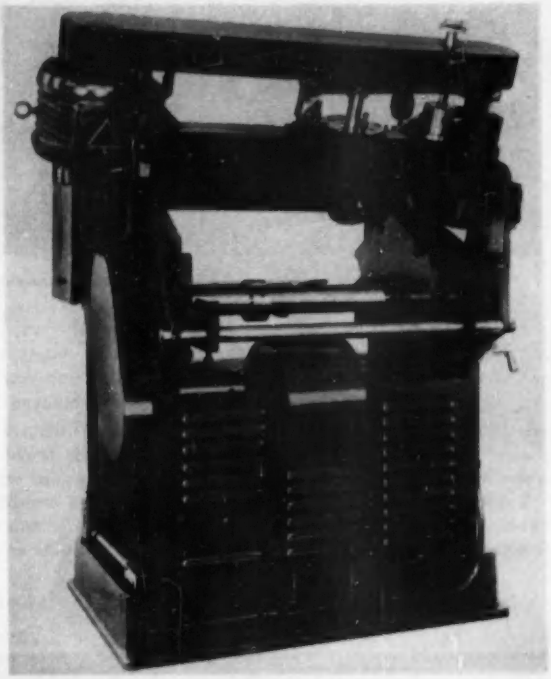
In addition to the standard sizes, Series 61 engine and toolroom lathes are also available in numerous plus-swing sizes. Leadscrew, feed rod, control rod and traverse rod on longer bed units are continuously supported by traveling carriers. They are automatically picked up or dropped off by movement of the apron. *Monarch Machine Tool Co.*

Circle 71 on page 89 for more data

NEW EQUIPMENT PLANT • PRODUCTION

For additional information, please use postage-free reply card on page 89

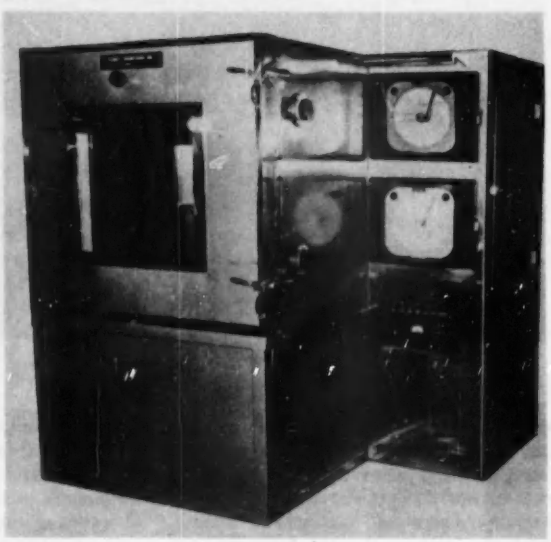
Semi-Automatic Hardness Tester



A semi-automatic Brinell testing machine recently announced automatically indexes pieces through both spot grinding and testing stations. At the rate of 400 pieces per hour, crankshafts, gun barrels, or other shaft-like parts, are fed into the machine. They slide out, ready for inspection. Designated Model RCB, it has a 30-in. work opening, and is hydraulically operated. (Detroit Testing Machine Co.)

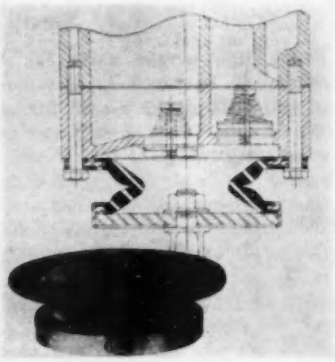
Circle 72 on page 89 for more data

Temperature Control Is Precise



A temperature control system has been developed which regulates chamber temperatures within one-half deg. F. Called proportional input control, instead of turning the heaters off as the temperature rises above a certain set point and on as it falls below, the heaters continuously turn on and off every four sec within a control band which extends on both sides of the set point. For a set value of 200 F, a two per cent control band width is used in one installation. When the chamber reaches 198 F the heaters automatically turn off for a fraction of a four-sec period. The heaters are off 50 per cent of the time at 200 F. Should the temperature exceed 200 F, the heaters are off longer than they are on. The temperature is said to deviate only slightly from 200 F and virtual straight line control is obtained. (Tenney Engineering, Inc.)

Circle 73 on page 89 for more data



Diaphragm of Bonded Rubber

Originally designed for use in shallow well pumps, the bonded-rubber diaphragm shown is manufactured from elastomers which resist the attack of corrosive solutions and abrasive slurries. The diaphragm also provides quieter pump operation. Other interesting applications for this type diaphragm exist on many hydraulic or air-accuated units. The diaphragm can be made in a complete range of sizes. (Lord Manufacturing Co.)

Circle 74 on page 89 for more data

Bar Feeder

A low cost hydraulic attachment for feeding screw machine stock eliminates feed fingers which often score bars. The Hydra-Lite features a signal light which turns on automatically as the bar end approaches, enabling the operator to be ready with a new bar without interval delays.

The new feed is a hydraulic, self-contained, independent unit. Each unit is equipped with its own hydraulic pump and supply of oil for feed.

Models are available for all No. 00,0, and 2 Brown & Sharpe machines, and feed stock from 1/16 in. to 1⅛ in. in diameter. Constant pressures are maintained throughout feed, regardless of length of bar stock, and accuracy is said to be high. *Aurora Precision Devices, Inc.*

Circle 75 on page 89 for more data

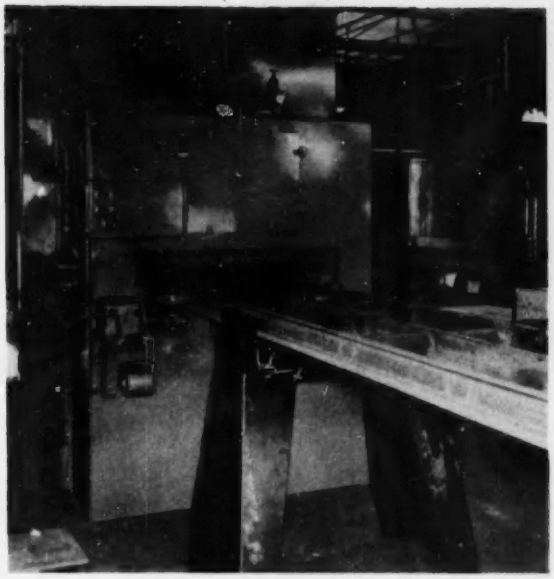
Wet Burnishing

A wet burnishing method is said to provide important savings through the use of revolving rubber mats which operate in a wet abrasive slurry. The parts to be burnished are advanced through the slurry on a carrier moving in a circular or other enclosure. On the new Ger-O-Matic machines, compounds in the abrasive slurry are reused over and over with little loss. The maker plans to both license and sell burnishing machines to industry. *Gerity-Michigan Corp.*

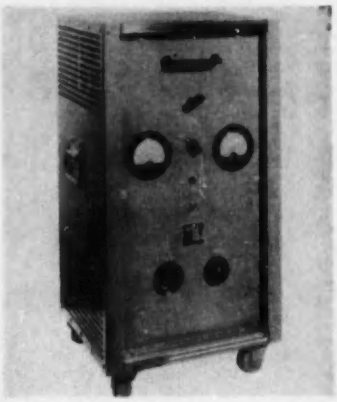
Circle 76 on page 89 for more data

Wing Slabs Peened to Shape

A special machine for the aircraft industry forms machined wing skins to a given curvature, eliminating the necessity for certain metal forming equipment and dies. Shot peening is performed on the integrally stiffened wing skin as it traverses through the machine. The wing skin is carried through the machine on a 50-ft table at variable speeds. Besides the economy and flexibility claimed for this process, residual stresses created by forming in this manner are said to prolong the fatigue life and improve stress corrosion resistance. The machine can be adjusted to process a variety of wing panel sizes to varying curvatures. (Cargill Detroit Co.)



Circle 77 on page 89 for more data



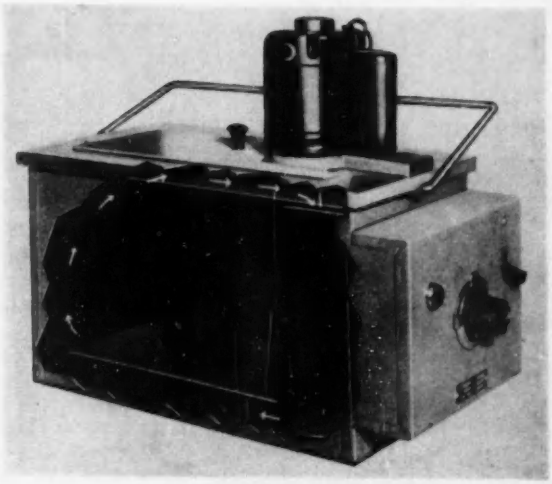
Tubeless 28-Volt Supply

A tubeless, regulated d-c supply, using magnetic amplifier principles, is now available. The unit is designated as Nobatron model MA2850 and delivers 50 amp at 28 volts (adjustable between 23 and 32 volts). Regulation accuracy is ± one per cent against line and load combined. It was designed for testing aircraft heaters, pitch changers, inverters, radar installations, fire control systems, as well as many other uses in and out of the aircraft field. (Sorensen & Co.)

Circle 79 on page 89 for more data

Dip Tank

The P/S-7 bench-type tank for Plastic Seal hot dip coatings has a 14-lb capacity. With the positive agitation created by the impeller type agitator, and special heating elements which radiate heat direct to the sides of the tank, more rapid heating and cooling is accomplished. Tests have shown it heats material from room temperature up to 360 F in approximately one hour. (Globe Imperial Corp.)



Circle 78 on page 89 for more data

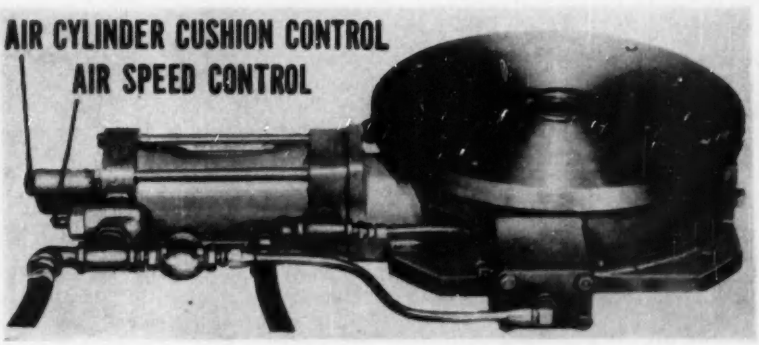
Table Features Adjustable Speed and Cushion

On the larger air index table No. 1405, both the cushioned stop and air speed are adjustable to compensate for variations in load weight and diameters. As loads and diameters are increased, cushioning can be increased to allow maximum speed of operation without damage to the mechanism or work.

The manufacturer states that the new table has been thoroughly tested. When operated with a 200-lb load 22 in. in diameter using an eight-station ring, indexes were made at a rate of 100 per minute. A speed of sixty indexes per minute was easily maintained with a load of 300 lb.

The new table has basically the same indexing mechanism as others in the line, and is said to be completely positive without backlash, skips or overruns. The 15-in. diameter is ground for accuracy and may be mounted horizontally or vertically. Air cylinder supplying power is 3½ in. in diameter. Either a four, six, eight, or 12 station ring is furnished as standard equipment but others up to 30 stations are made to order. Table operates on ordinary line pressures from 60 to 175 lb. *Air Hydraulics, Inc.*

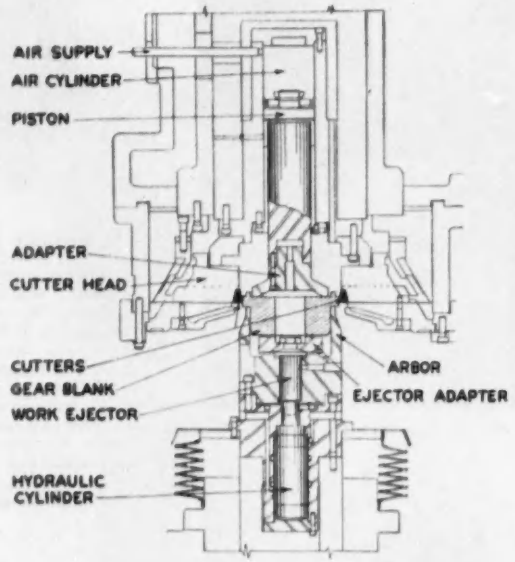
Circle 80 on page 89 for more data



The A-H index table with speed and cushioning adjustable.

NEW EQUIPMENT — PLANT • PRODUCTION

For additional information, please use postage-free reply card on page 89



The ejector cylinder is mounted integrally with the vertical ram which carries the work arbor. An adaptor attached to the hydraulic piston is raised against the lower face of the gear to eject it after the cutting cycle is completed. Only plant air is required in the air cylinder for clamping. No accumulator tank is needed.

Work Holder Ejector

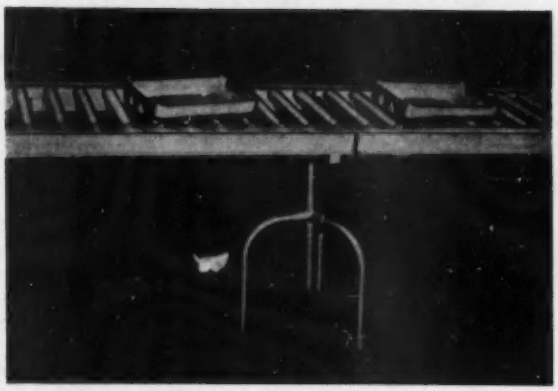
Two devices are now available, at extra cost on the complete line of Shear-Speed gear shapers. A pneumatic holding mechanism built into the head of the shaper allows for automatic positioning of the gear blank and clamping it in place during the shaping operation. A manually controlled hydraulic device ejects the gear blank after the shaping operation is completed.

Cup-shaped sleeve adaptors are fitted into a tapered hole in the bottom of the air cylinder piston. These adaptors fit over the top of the arbor when working on a hole gear, or over the end of the gear shaft, and move down to bear against the upper face of the gear. *Michigan Tool Co.*

Circle 81 on page 89 for more data

Lightweight Conveyer

A portable roller conveyor system now available is fabricated entirely of magnesium. Of standardized construction throughout, the conveyors can be installed as a complete system, or supplied in individual sections, with couplers to match existing equipment. Portable magnesium stands in three height ranges, from 17 in. to 72 in. above floor level, are also offered. (Magline Inc.)



Circle 82 on page 89 for more data

Ceramic Kiln

Industry is invited to inspect a high temperature (3000F) gas fired, car tunnel kiln, which has been in operation continuously for one year, under field operating conditions.

Designed to insure uniformity of firing, also reduce firing costs, the kiln is primarily used for firing high temperature refractory components. However, the flexibility of design makes the kiln adaptable to the bisque or glost firing of all whiteware as well as refractory products.

One of the features is the hydraulic pusher mechanism mounted under the kiln, resulting in an economy of floor space. An interlocking safety control system protects the furnace in the event of a power, blower or governor failure by means of pressure-stats and solenoid valves. A two-zone hot section, each controlled by motor operated valves, provides completely flexibile control of the soaking treatment and makes the kiln particularly adaptable to frequent pushing-schedule changes. This line of kilns is custom engineered. *Lindberg Engineering Co.*

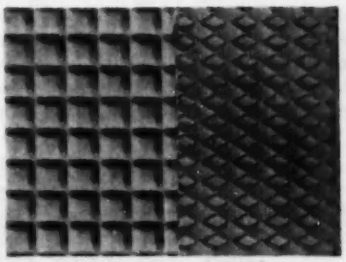
Circle 83 on page 89 for more data

This Lindberg kiln is 16 in. wide by 15 in. high by 64 ft long and is gas fired. However, it is available electrically heated.

NEW PRODUCTS

FOR ADDITIONAL INFORMATION, please use postage-free reply card on PAGE 89

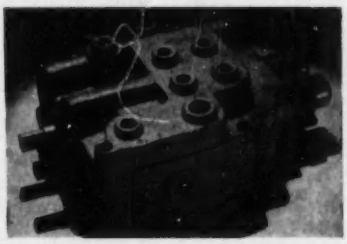
New Pattern Added to 3-D Line



Two new pattern designs of three-dimensional, design-strengthened metals have been added to a current line. Pattern 1-SQ is available in widths up to eight in., pattern 2-DD in widths up to seven in. Four finishes are possible at present: Mill finish as rolled; mill finish with highlights; colorized and highlighted; and painted or porcelain enameled without highlights. The reverse sides of the sheets give added effects. These two patterns are easily matched in fabrication or installation and may be had in ferrous or non-ferrous metals, solid or perforated, sheet, strip and coil. *Rigidized Metals Corp.*

Circle 26 on page 89, for more data

Hydraulic Valve Features Smooth Control

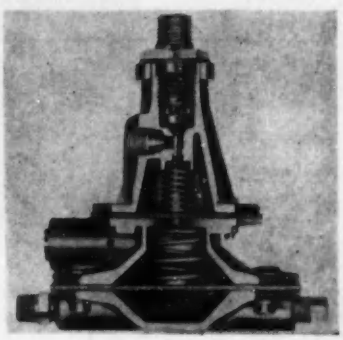


A series of directional control valves for mobile equipment is now on the market. The spool groove on the new valve is coined straight down in a V-slot permitting accurate control and smooth metering action. There is full metering in all porting.

The new valve was designed in four sizes to allow flow of eight, 16, 23 or 35 gal per minute. There are one, two, three and four spool models. Single and double acting spools are interchangeable. In the smaller sizes, the device can control pressure up to 2500 psi. *Parker Appliance Co.*

Circle 27 on page 89 for more data

Air Tank Drain Blasts Off Sludge



Redesigned pressure seals are a feature of an improved tank drain, for air brake and compressed air tanks. The Model 1022 eliminates manual draining of air brake systems by blasting off water, oil and sludge accumulated in the bottom of the receiving tank. The unit is designed to operate even at low temperatures.

An accessory governor actuates the drain diaphragm once in each compressor cycle. These units are said not to rob brakes of needed pressure. An adjustable bleeder can be set for a discharge of any chosen duration, during which moisture and sludge accumulations are blasted from the system under full tank pressure.

A safety feature is the double valve into the pressure tank. Even if the drain should be accidentally sheared off the vehicle, braking would not be affected. *Wilkerson Corp.*

Circle 28 on page 89 for more data

Triple-Purpose Cleaning Gun for Small Parts

Recently introduced is a triple-purpose sand blast, liquid, and air cleaning gun. Known as Carco, it is said to be highly efficient for cleaning small parts and surfaces.

The unit reportedly operates efficiently on air pressures of 75 lb and up. Maximum efficiency for sand blasting is obtained with air pressures of 100 to 140 lb.

The gun has a light metal body, valve and trigger assembly, and is equipped with a hardened steel jet and nozzle.

Among its suggested applications are: cleaning spark plugs, removing paint and rust, removing carbon, cleaning welds, cleaning radiators, and cleaning corroded parts. *C. A. Roesch and Co.*

Circle 29 on page 89 for more data

NEW PRODUCTS

For additional information, please use postage-free reply card on page 89

Non-Adjustable Direct Pressure Clutch

This heavy-duty, non-adjustable, Lipe DP (direct pressure) clutch has just been introduced.

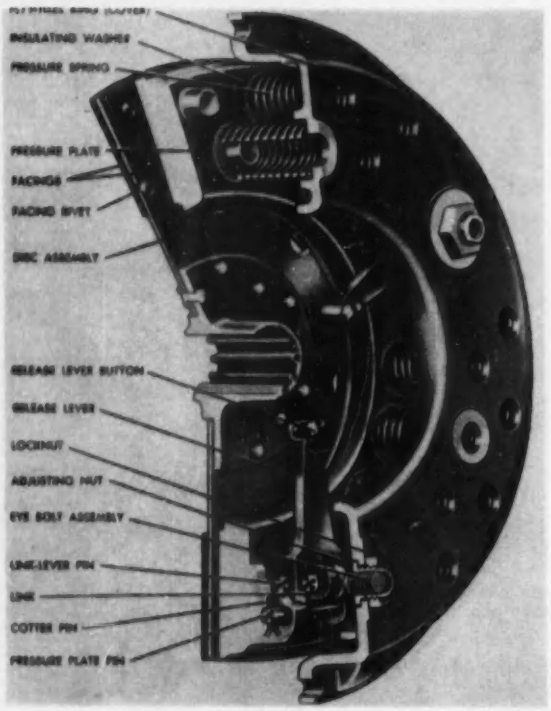
Two design advantages—rugged structure and broader interchangeability with other direct pressure clutches in the field—have been combined with high torque capacities, minimum parts, low release loads, and positive engagement. The DP clutch is of the dry-disk push-type construction.

Regular automotive clutch pedal adjustments are applicable, when necessary, to maintain proper clearance between the clutch release bearing and the release levers. By means of driving lugs in the flywheel ring and mating slots in the pressure plate, the clutch flywheel ring, which is attached to the engine flywheel, drives the pressure plate. A series of springs, arranged in three groups on the pressure plate provide plate pressure on the driven disk assembly. The movement of the pressure plate during engagement or disengagement is controlled by a release lever located between each group of springs. To provide long wear resistance the end of each release lever is capped with a hardened button, made from bearing race stock.

Thirty-three ventilating holes, located on the top and along the side walls of the clutch cover allow the circulation of air to reduce the thermal effects of friction heat.

Single and double plate sizes of the new clutch are contemplated, ranging in the single plate size from 12 in. through 15 in., plus a 17 in. size, and in double plate models in 14 in. and 15 in. sizes. These sizes will supply ample torque capacities for engines developing from 200 to 1400 ft-lb of torque. Various models of the DP clutch will accommodate standard flywheels or bell housings. Conventional driven member assemblies with commercial facing materials and spline sizes are available with DP clutch assemblies. *Lipe-Rollway Corp.*

Circle 30 on page 89 for more data



Although non-adjustable and although no internal adjustment is required to compensate for facing wear, an internal clutch adjustment on the DP clutch has been provided for rebuilding purposes or —when replacing the pressure plate—to restore the original lever position for full facing wear.

Pressure Cement

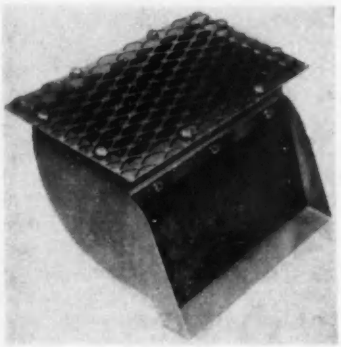
An industrial adhesive takes only fingertip pressure to join materials together. The adhesive will permanently fasten rubber, metals, wood, plastics, ceramics or fibers together in any combination. Tensile strength is 10,000 psi. It resists attack by salts, alkalis, acids, moisture or solvents. *Cycleweld Products Div., Chrysler Corp.*

Circle 31 on page 89 for more data

One-Way Vent

This ventilator was designed to insure uniform air circulation and better rear seat heating and cooling. It is installed under the rear seat of a vehicle.

Known as the Auto-Vent, the device acts as a low velocity cold air register. Pressure of the air entering through the heater or ventilator opens



a neoprene flap covering the outlet, against its own weight, and allows air to pass from inside to outside. When all windows are closed, the front-to-back cycle of air circulation is said to permit full travel of air currents through the rear seat area. The neoprene flap also acts as a check to prevent air or exhaust fumes from entering through the outlet. There is no return flow. *F. J. Florin Co.*

Circle 32 on page 89 for more data

Delay Switch

A new delayed action switch keeps automobile lights on up to 1½ minutes to light the driver's path after he leaves his car. The switch is molded of Bakelite phenolic plastic and is designed for easy mounting on the dashboard. After turning off headlights with the regular switch, the driver presses the delayed action switch, which turns the lights on again. A screw in the end of the switch permits the turn-off action to be adjusted up to a maximum of 1½ minutes after the button is pressed. *Edco International Corp.*

Circle 33 on page 89 for more data

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FREE LITERATURE

Special Tools 1

A complete collection of data sheets on collets, collet fixtures, gearless drill heads, drill jigs, drilling units and machinery, keyway broaches and machines, is offered in manual No. 14. *Zagar Tool, Inc.*

Stretcher 2

Pictures and specifications of a precision stretch former for rib-type shapes are given in form SF 1053. *Cyril Bath Co.*

Turbine Power 3

Two types of gas turbine driven generator sets are described and illustrated with cutaways in a booklet now available. Both units—one rated 14 kw a-c/d-c, the other 14 kw d-c—are powered by the Mars gas turbine engine, and were developed primarily for aircraft auxiliary power uses. However, the company is inviting inquiries on new industrial applications of either the generator sets or the basic gas turbine engine. *Solar Aircraft Co.*

Ring Binder 4

An 8½ x 11-in. ring binder with ten acetate pockets is described in a wholesale price catalog. The binder should be handy in engineering departments for filing often-used blueprints. *International Sales Co.*

Sonic Cleaning 5

How the ultrasonic generator works, the principles of high-frequency sound cleaning, and examples of present applications are explained in a new bulletin announced as available. Designated as GEA-6056, the two-color, four-page publication explains how the ultrasonic action of the generator hastens cleaning by as much as 100 times. *General Electric Co.*

Reamers 6

A four-page specification sheet lists the Blue Helix line of reamers. *Pratt & Whitney Div., Niles-Bement-Pond Co.*

Spiral Milling 7

Heavy duty universal spiral milling attachment, publication M-1816, shows pictures and gives specifications for this head. *The Cincinnati Milling Machine Co.*

NEMA Motor Standards 8

An 18 x 24-in. wall-chart, which shows the comparison between "old" and "new" NEMA standard dimensions for a-c motors from one to 30 hp, is available. The chart is meant to provide a handy reference for determining differences in frame dimensions. *Westinghouse Electric Corp.*

(Please turn page)

VOID After Mar. 1, 1954 1/1/54

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Clad Metals

"An Introduction to Clad Metals," just announced, offers a comprehensive survey of the manufacture and applications of the stainless-, copper-, brass- and other clad steels produced by various companies. Write to *Superior Steel Corp., Carnegie, Penna.*

Die Casting 9

An eight-page bulletin 23.2 on die casting machines describes in detail a complete line, with specifications on the standard sizes of these machines. The maximum specifications of injected metal is shown for each machine model equipped with standard injection units. These specifications are listed in two separate charts, one for aluminum, magnesium and brass type machines and a similar one for lead, tin and zinc die casters. *Lake Erie Engineering Corp.*

New Werner Facilities 10

A facilities folder outlines the equipment and services for custom aluminum extrusion and roll forming of aluminum and stainless steel at their Greenville, Pa., and Oshawa, Canada factories. *R. D. Werner Co.*

Plastic Sheet 11

A new kind of rigid plastic copolymer sheet, S-300, now available in any length, from 20 to 58 in. wide and 0.005 to 0.125 in. thick, is specified in a four-page booklet. *Chicago Molded Products Corp.*

USE THIS POSTCARD

Highway Building 12

A copy of the statement made to the House Public Works Committee at a hearing on federal-aid road program by James Cope, vice president, Chrysler Corp., is now available. *Automobile Manufacturers Association.*

Layout Templets

Publication of a catalog listing all two-dimensional templets for plant layout, on adhesive-backed film, is announced. It is available, on letterhead request, to *Repro-Templets Inc., Oakmont, (Allegheny County), Pa.*

Vibration 13

Vibration isolation for a wide variety of equipment through properly engineered application of Armstrong's Vibracork is described in a new bulletin, VC-501. *The Korfund Co.*

Dual Valve 14

A dual air valve is designed specifically to eliminate accidental stroking due to valve failure. It consists of two independent pilot operated valves, actuated by electromagnets, and the main valves, actuated by air. Bulletin 1902 gives details. *Danly Machine Specialties, Inc.*

Facilities 15

In order to show the broad scope of its Aircraft Tooling Div., this firm has recently released a four-page brochure; it both designs and engineers all aircraft tools, dies, jigs, fixtures, templates, lofts, dollies, press blocks, assemblies and weldments. *Twix Mfg. Co.*

Carbide Tools 16

A 92-page catalog of carbide cutting tools shows standard carbide tipped milling cutters, end mills, reamers, drills and single point tools as well as miscellaneous carbide tipped tools, solid carbide tools and ejector tools, all of which are stocked items. Illustrated also are various types of special carbide tools. *Super Tool Co.*

Drawn Boxes 17

The 1954 catalog listing more than 750 precision, seamless deep drawn boxes available from standard tooling may be had on request. *Zero Manufacturing Co.*

Magnetic Chucks 18

The latest edition of Superpower magnetic chuck catalog No. 411 gives chuck sizes, specifications, and prices, as well as general information concerning applications and advantages of magnetic chucking. *Taft-Peirce Mfg. Co.*

Cylindrical Grinding 19

A 32-page booklet, CGI-53, features 15 case studies of successful cylindrical grinding installations. Contains over 60 photographs with operation sketches and specifications. *Landis Tool Co.*

(See preceding page)

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ROBERT S. CLINGAN
GENERAL MANAGER OF SALES

Director
g Engineering Office
Company
Michigan

Sir:

Your order for cold drawn leaded 4140 annealed bars* was shipped today. You can expect the superior machining qualities of Ledloy to result in increased production, longer tool life and finer finishes.

As you are probably aware, the lead exists in this steel as well dispersed, submicroscopic particles in a pure form and has no effect upon its mechanical properties. Forgability, carburization, or heat treatment are, therefore, not adversely affected by the presence of the lead. Fortunately, too, there are no health hazards involved during the course of machining, heat treating, or normal handling.

Several users have reported increases of 30% to as high as 75% in machinability on production runs. This, they feel, is primarily due to the lessening of friction between the chip and the tool, which permits higher speeds without burning of the cutting edge. Similarly we feel sure that our lead steel alloy will substantially reduce your production costs and would appreciate comments on its use in your plant. If you would like any assistance or additional information regarding the application of leaded steel to your products, our Field Representative will be pleased to assist you.

R. S. Clingan
General Manager Sales

Copperweld also offers leaded alloy and electric furnace steels in other standard analyses and in a variety of sizes and surface conditions. These include not rolled and cold finished bars, annealed or heat treated. Bar finishes include cold drawn, ground or turned and polished, within our range of manufacture. Semi-finished products such as billets and blooms are also available for re-rolling or forging purposes.

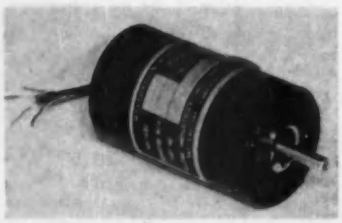
*Inland LEDLOY License

NEW AIRCRAFT PRODUCTS

FOR ADDITIONAL INFORMATION, please use postage-free reply card on PAGE 89

Motors for 400 cps

A line of miniature precision motors for 400 cps applications are of the hysteresis-synchronous type for power, servo or timing applications. The



motor is 1¼ in. in diam by 2¼ in. long. It is available with a two pole or four pole winding, for 24,000 or 12,000 rpm.

For servo applications, the motors can be wound for two phase operations, and for timing and power applications, they are available as single phase capacitor-run motors. All Globe standard gear reducers, both spur and planetary, can be furnished with these motors as a combined package. The rotor is mounted on double shielded, grease-packed ball bearings. The stator windings employ Teflon insulated magnet wire. *Globe Industries, Inc.*

Circle 46 on page 89 for more data

Compass Control

Two miniaturized control panel units, models ED 100 (electric coupling) and ED 200 (mechanical cou-

pling), for AN/ARN-6 aircraft radio compass installations, requiring half the panel space and weighing 75 per cent as much as previous designs are available for quick delivery. The units are 5.75 in. wide, 4.5 in. high, 4 in. deep and weigh 2.8 lb for standard console or rack mounting as per military specifications (AND10479). Two of the new panels can be mounted in the same space now required for one of the older units.

The ED 100 control panel replaces C-423(B)/A—ARA-19 and C-685/A—ARA-19. The ED 200 control panel replaces C-403( )/A—ARN6, also C-758/A—ARN6, and C-149/A—ARN6. New unit ED 100 is made to conform to military specifications (MIL-C-7777). Where a tuning meter is desired, it will be supplied as a separate unit. New unit ED 200, is also constructed to conform to applicable military requirements. *Research & Control Instruments Div., North American Philips Co.*

Circle 47 on page 89 for more data

Masking Tape

A pressure-sensitive tape for the metal finishing industry — for high heat masking use by aircraft and electronic manufacturers on such treated metals as anodized aluminum, pickled steel, and dichromated magnesium—was announced recently. The new tape, "Scotch" brand high temperature masking tape No. 214, is expected to find widespread use by aircraft assembly, engine, and parts manufacturers, as well as throughout the entire metal finishing trade.

It is designed for masking use in oven temperatures up to 325 F, and is capable of withstanding "much longer bake cycles than previously possible." Laboratory and field tests show that the tape can be used in oven cycles even as high as 375 F, and at room temperatures as well.

In addition, tape No. 214 is said to have the ability to remove cleanly from anodized aluminum and other treated metal surfaces without leaving adhesive deposit. *Minnesota Mining and Manufacturing Co.*

Circle 48 on page 89 for more data

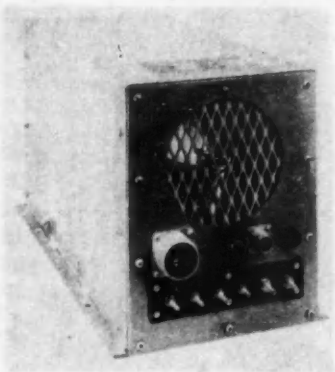
Gear Motors

A series of permanent magnet d-c motors and gear motors can be supplied with overload torque limiting clutches. They measure 1 3/16 in. in diameter by 4 in. in length. Output speeds can be varied by changing the gear set to as little as one rpm. The motors are designed in conformance with military specifications. *Mission-Western Engineers, Inc.*

Circle 49 on page 89 for more data

Power Supplies

A complete line of airborne power supplies is being introduced, consist-



ing entirely of non-wearing or static electrical components. Selenium rectifier cells and magnetic amplifiers form the heart of the units.

They were designed to meet JAN specifications and USAF exhibit WCEE2-2A, Nov., 1951. Units are absolutely insensitive to temperatures from −65C to +72C. The features include the following listing of specifications: ac input, 200 volts, ±10 volts, 400 cycles, ±20 cycles, three phase; dc output, 0 to 500 amperes, 28 volts (Amperage depending on unit); regulation, better than ±one per cent from no load to full load; response, 0.2 seconds full recovery for any load variation or line variation; ripples, two per cent rms. *Inet, Inc.*

Circle 50 on page 89 for more data

of the

leading automotive engine manufacturers using chrome rings as original equipment specify

Perfect Circle

the standard of comparison

The application of solid chrome to piston rings, as perfected by Perfect Circle, more than doubles the life of pistons, rings and cylinders. Performance data will be furnished on request. Write Perfect Circle Corporation, Hagerstown, Indiana. The Perfect Circle Co., Ltd., Toronto, Ontario, Canada.

(*Continued from page 80*)

bending. The 20-ton tube and pipe bender features a fast automatic indexing arrangement controlling the angle of bend selection and it is said to permit handling a much broader range of multiple bends with a single tooling setup.

Again—Tool Orders Drop

New orders for machine tools during October dropped nearly 11 per cent from the September level to approximately $59 million, the lowest total since the start of the Korean war in June 1950. Cancellations during the month amounted to 20 per cent of new business placed, the largest percentage since June 1952. Unfilled orders also showed a decline to slightly more than 6½ months production. Machine tool builders say that the decline in October could be expected as a seasonal trend and that competition from foreign sources accounts for part of the drop in business. Also, some companies feel that the previous high level of business was abnormal but that industry still is looking for new equipment that will produce at lower cost and it will be from this source that new business will gain its strength.

Gears Up

October, 1953, for the gearing industry was rather promising with a 55.7 per cent increase over September. The AGMA index is 211.1 for October.

Package Plan

Industrial consumers can now purchase a packaged installation of complete production equipment manufactured by Lake Erie Engineering Corp., Buffalo, N. Y. As a part of the service Lake Erie engineers will survey the customer's hydraulic press or die casting requirements and make specific recommendations. They will design, manufacture, supply and install all the basic machinery, tools and dies, conveyors, loading mechanisms, furnaces, and other related auxiliaries. The field force will install or supervise the installation of the complete equipment in the customer's plant.

The Handling Year

Howard M. Palmer, 1953 past-president of the Material Handling Institute, Inc., recently summed up the year in materials handling activities. Briefly, he stated that shipments of material handling equipment increased over 1952; top management gave handling more consideration; several mergers of equipment companies were announced and the shortage of trained manpower at all levels was a problem to both manufacturers and users.

Citing Mr. Palmer's report, "The industry's volume has reached $1¼ billion worth of material handling equipment — conveyors, pallets, steel strapping, hoists, cranes, monorail systems, skids, tote boxes, elevators, wheeled floor trucks, electric and gasoline-powered industrial trucks—which has reduced the costs of and made possible the more efficient production of $108 billion worth of manufactured goods plus the warehousing and distribution of these goods—about one dollar of material handling equipment for each 100 dollars of manufactured products."

He also stated that the results of a questionnaire circulated at the MHI show in Philadelphia, May, 1953, to all MHI members exhibiting show that the next MHI exposition is now contemplated for 1956.

METALS

(*Continued from page 79*)

Copper deliveries by fabricators in 1953 which are a tolerably good index of consumption, will probably top last year's total of 1,391,500 tons. However, the rate of deliveries has declined appreciably in the three months August-October as compared with earlier in the year, and indicate that consumption in 1954 will be lower than in 1953.

Brass Output Lower

Brass fabricators foresee a 10-15 per cent decline in sales in the first quarter of 1954. The automotive plants, which account for some 20 per cent of the total brass business, have been reducing inventories. It is freely acknowledged that business is now highly competitive. The falling off in new orders started early in the fall months, and while shipments have been heavy, it's been at the expense of backlogs. The three major brass mills have reduced their work week and some price cuts have been made. Customers have been slow to place new orders, believing prices will slide with any decline in the copper price.

Tin Agreement Is Drafted

A stabilizing pact for tin has been drawn up at the international conference of tin producers and consumers at Geneva with these principal features: Council would fix export quotas for each producing country. A manager would administer a buffer stock of tin, equivalent to 25,000 tons, and would be empowered to sell tin when the price advanced to $1.10 per lb and to buy it at 80 cents. Countries that have national stockpiles would agree not to dump tin on the market without six months' public notice. The plan could become effective March 1, 1954.

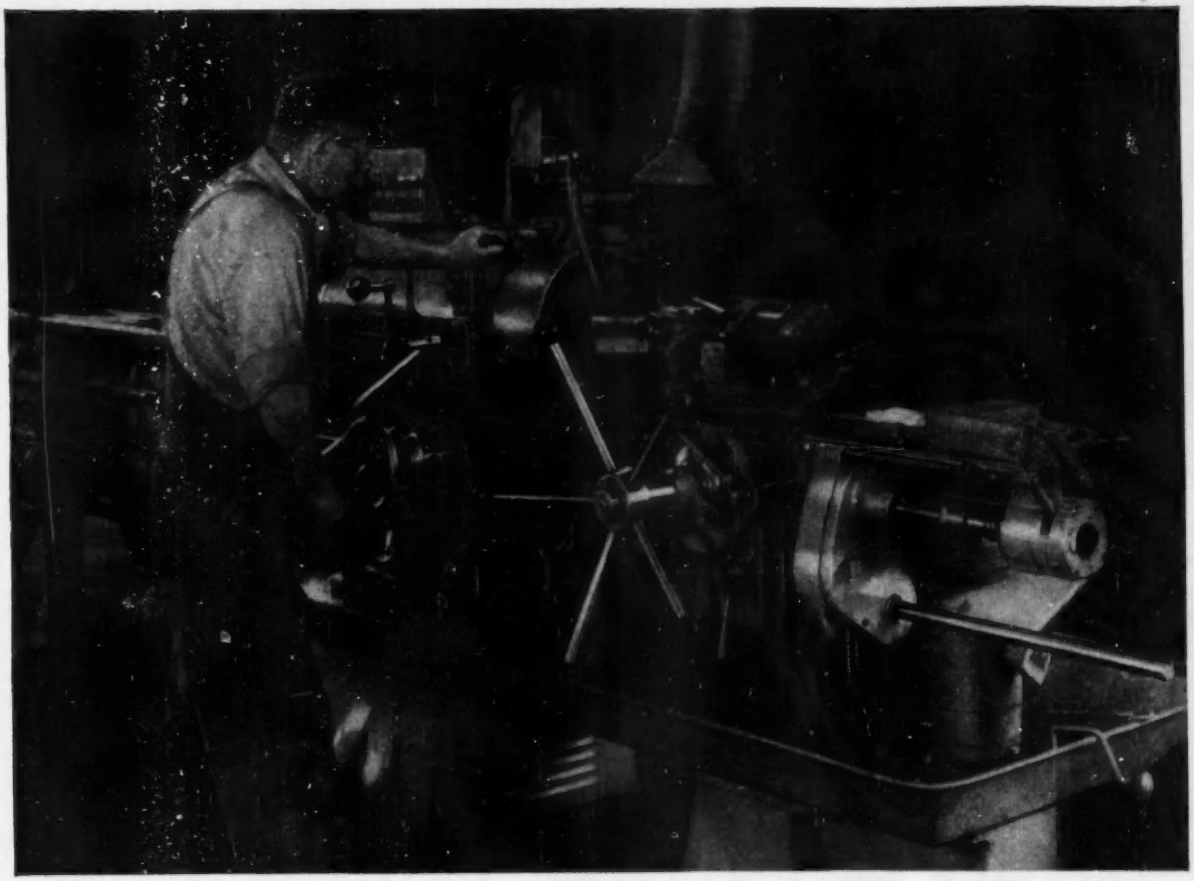
The United States delegation refused to commit this country one way or the other and as the world's most important consumer its approval is almost essential for success of the plan. Early optimism over the negotiations which resulted in firming up the price from 76 to 86 cents per lb, was badly shaken when news came from the U. S. that this country would show a surplus over its stockpile requirements of 40,000 tons by next March, and might want to sell the metal at the market.

Considering that this tin was acquired at prices ranging from $1.03 to $1.80 per lb, such procedure would result in a heavy loss. It appears likely that Washington will overcome its reluctance to approve of a cartel—which is exactly what this agreement comes down to—and for a variety of practical reasons, join with the other countries in endorsing the plan. This should result in a more orderly market for tin in 1954.

Third Round Aluminum Production Expansion Postponed

Consumption of aluminum by American industry will total about 1,700,000 tons in 1953, a 25 per cent increase over 1952. Almost all the increase comes from wider civilian use. Domestic production will reach about 1,250,000 tons, a new high record, and should exceed 1.5 million tons in 1954. The aluminum building products industry reported a 38 per cent increase in 1953 over last year in the amount of metal used.

Nevertheless, recommendation from Washington for a third round of aluminum production expansion has been postponed. This comes from the belief in official circles that aluminum requirements by the Department of Defense may have been overstated. Military consumption has been declining and civilian demands have not been as strong as was expected in recent weeks. The sharp decline in the zinc price has slowed up the inroads that aluminum as a competitive material was making in the die casting industry when zinc sold at nearly double today's price.



MACHINING FOR GOLD at Homestake

with Gisholt Turret Lathes

Yes, gold mining means machinery. And here at the famous Homestake Mine at Lead, South Dakota, Gisholt Turret Lathes help to machine the machines that dig for gold. It's a big job, too—turning out the variety of rock bits and drill rods that are used up in large numbers.

This Gisholt Ram Type Lathe was first used to turn the plain ends on the one-inch quarter-octagon drill steel for two types of rock bits. Production averaged 30 an hour. Now, the machine is also used to machine and thread three sizes of forged steel drill rods. Besides all this, the Gisholt has the job of facing and chamfering the chuck, or shank ends, of the drill steel so that a perfectly flat face is hit by the drill machine tappet.

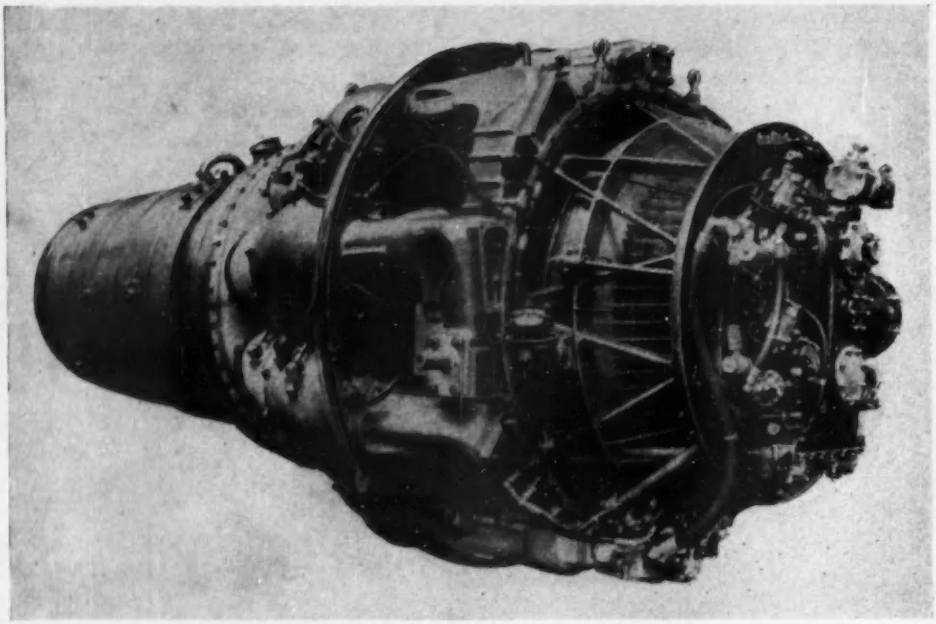
Here, again, Gisholt Ram Type Turret Lathes prove their easy change-over and ability to produce profitably, even on small runs—big assets in any machine shop. Ask your nearest Gisholt representative about them. Or write us.

GISHOLT MACHINE COMPANY

Madison 10, Wisconsin

THE GISHOLT ROUND TABLE *represents the collective experience of specialists in machining, surface-finishing and balancing of round and partly round parts. Your problems are welcomed here.*

TURRET LATHES · AUTOMATIC LATHES · SUPERFINISHERS · BALANCERS · SPECIAL MACHINES



The Verdon jet engine which has a thrust of 7700 lb.

Jet Engine Thrust Increased, Specific Fuel Reduced

EXPERIMENTAL work extending over a period of two years has enabled the Hispano-Suiza Co., of Paris, to increase the thrust of the Tay jet engine from 6237 lb to 7700 lb, with a slight reduction in specific fuel consumption.

The Tay, received from Rolls-Royce under license in June, 1951, had a thrust of 6237 lb and a specific fuel consumption of 1.10 lb/hr/lb. By September of the following year, the third Tay in the Hispano-Suiza pre-series line had a thrust of 6424 lb and specific fuel consumption reduced to 1.07. On a 15-hr test a thrust of 6820 lb was maintained, with the original specific fuel consumption. In May of this year the Hispano-Suiza Tay, designated the Verdon 04, maintained 7260 lb thrust on an official qualifying test of 25 hr, with a fuel consumption of 1.07 lb/hr/lb. Finally, in July, a Verdon 04, intended to be installed in a Mystère plane, attained a thrust of 7700 lb without any increase in the specific fuel consumption.

In this development work Hispano-Suiza has sought to use the maximum number of parts of the original Tay series, as well as the same tools and jigs. While retaining the main characteristics of the Tay and being completely interchangeable with it, the Verdon is an entirely improved version. Cross sections are the same and weight has undergone little change. Indeed, the Verdon is somewhat lighter, by reason of a saving in weight of the rotating parts. The improved performance without any increase in specific fuel consumption is attributed to a larger air supply obtained by internal modifications; better efficiency of the turbine; and a slightly higher average temperature after the turbine.

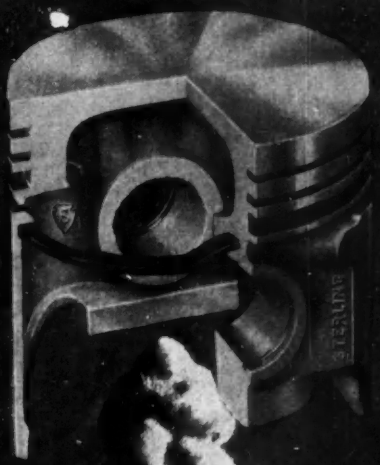
The air delivery pipes from the compressor housing have been lengthened a few inches. The air entry to the compressor has been improved both in design and in the volume of air admitted. Further, the jet cone has been adapted to the increased volume of gas. The speed of the pumps has been stepped up a little in order to deliver a greater quantity of fuel. For the same reasons, changes have been made in the burners and in the barometric corrector.

To simplify the task of the pilot, an electro-magnetic temperature regulator is fitted after the turbine.

NEWER

Than Nuclear Fission !

METERED STEEL REACTOR



Now Allows You To Specify Your Own Piston Clearance!

STERLING

CONFORMATIC PISTONS

Tests now prove that by varying the strength and design of the steel insert we can pre-determine piston skirt expansion and contraction to meet any engine clearance specification.

CONSTANT CLEARANCE over the entire temperature range from −20° F. to 200° F. Closer clearances than ever before possible without danger of scuffing or seizing.

STERLING ALUMINUM PRODUCTS INC., SAINT LOUIS, MISSOURI

News of the AUTOMOTIVE AND AVIATION INDUSTRIES

Continued from Page 39

Nash Shows Deficit in Fourth Quarter

Although Nash reports a net profit for the fiscal year 1953 greater than that of the preceding year, the company had suffered a loss of more than $1 million in its fourth fiscal quarter ended Sept. 30, 1953. Earnings for the full year totaled more than $13.1 million, compared with $14.6 million for the preceding year. Its fourth fiscal quarter loss was attributed to a long shutdown from July 2 through Sept. 14 when no passenger cars were produced because of inventory dislocations.

Kaiser Plans Early Move to Toledo

Now that the sale of its Willow Run plant and surrounding plants to General Motors has been completed, Kaiser Motors will move its headquarters to Toledo soon. Part of the Willow Run plant will be retained by Kaiser for up to one year under lease from GM.

Production of Kaiser cars, however, will be moved to the Willys plant at Toledo, where both Willys and Kaiser products will be turned out. There has been no definite statement yet as to whether Heny J production will be resumed at Toledo.

Kaiser Motors and Willys Motors together will have a total of 8.3 million sq ft of plant space, including 5.2 million sq ft at Toledo, 18 per cent more than at Willow Run, and several other Kaiser and Willys plants. These include a new stamping plant at Shady Side, O., an engine plant at Detroit, foundry at Pontiac, machining plant at Dowagiac, Mich., and electronics and engine plant at Anderson, Ind., an aluminum forging plant at Erie, Pa., and a branch assembly plant at Maywood, Calif.

Ford Denies Closing of Chester, Pa., Unit

Ford Div. of Ford Motor Co. has denied rumors that it intends to shut down or move its Chester, Pa., assembly plant. The facility, which moved to Chester from Philadelphia in 1928, now has a monthly payroll of more than $1 million and is the only passenger-car assembly plant in Pennsylvania.

Seiberling Rubber Co. to Build New Plant

Seiberling Rubber Co. plans to build a new plant at Newcomerstown, about sixty miles south of Akron. The company did not reveal what will be manufactured at the new plant other than that it will be a product different from Seiberling's regular lines.

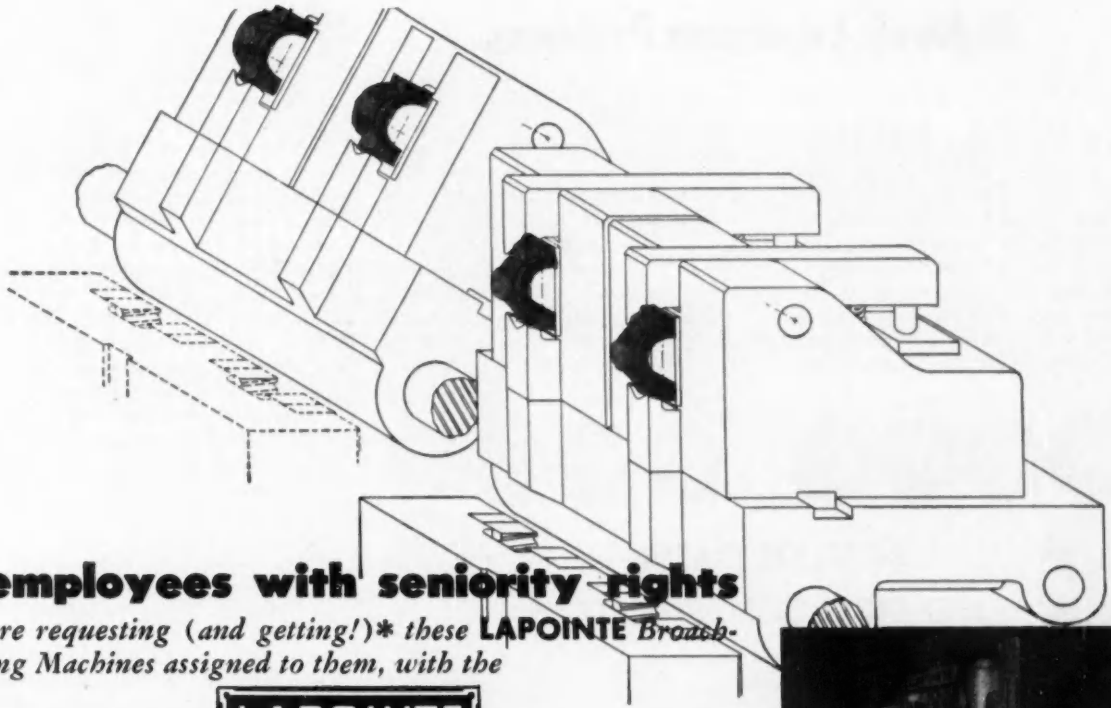
Local automobile retailers with close ties to car manufacturers may be prosecuted for alleged unfair labor practices under authority of the Taft-Hartley Act, even though any retailer so charged may operate wholly within one state. U. S. Supreme Court made this decision by an 8-1 margin recently.

Only two standards—a good management record and ability to repay—will be used henceforth by Small Business Administration in determining whether a small company is eligible to apply for one of its loans.

Air Force leaders now are confident they can expand their aerial strength to 115 wings in 1954 and 120 in 1955.

POWERFUL AND FAST-MOVING FERRARIS

Although both the Ferrari America 375 and the Ferrari Europe 250 have the same Pinin Farina body, their specifications differ to some extent. The former has a 12-cyl engine with a bore of 84 mm and a stroke of 68 mm. Compression ratio is 8:1, while maximum output is 300 bhp at 6300 rpm. Although it also has a 12-cyl engine, the 250 has a bore and a stroke both 68 mm. Its compression ratio is likewise 8:1, but maximum output is 200 bhp at 6300 rpm. Both cars have a wheelbase of approximately 109 in.



employees with seniority rights

are requesting (and getting!) these* **LAPOINTE** *Broaching Machines assigned to them, with the*

exclusive **LAPOINTE**

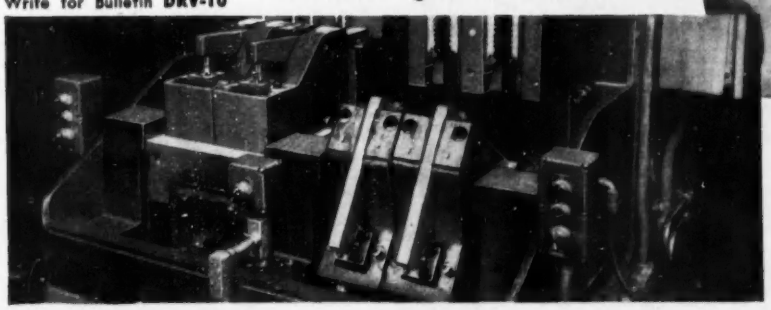
DOUBLE TIP-DOWN FIXTURE

why? *Because they have found these machines so convenient for part handling!*

Here are the reasons: *Fixture tilts down toward the operator*

- . . . for safe and convenient handling of parts
- . . . in the most natural position
- . . . into inclined, unobstructed work nests
- . . . already visible and easily accessible *without reaching across the machine!*

Write for Bulletin **DRV-10**



The **LAPOINTE** Double Tip-Down Fixture operates hydraulically and is electrically interlocked in synchronism with the travel of the broach assemblies, cutting on one ram while the other ram is being loaded.

Straddle broaching the sides of **Automotive Connecting Rod Cap,** removing a maximum of 1/8" of stock per surface from the forging . . . with the **LAPOINTE** 10-ton, 42-inch stroke Double Ram Vertical Surface Broaching Machine. With this machine, even a green operator who had never before run a machine was able to produce 750 parts per hour!

*An actual case! (Name on request.)

LAPOINTE

THE WORLD'S OLDEST AND LARGEST MANUFACTURERS OF BROACHING MACHINES AND BROACHES

Highway Expansion Problems

(*Continued from page* 66)

The third speaker, Richard M. Zettel, economist, Institute of Transportation and Traffic Engineering, University of California, drew attention to the complex intergovernmental relationships involved in highway financing. In reviewing the various schools of thought on the respective roles of the Federal Government and the states in highway financing, Mr. Zettel declared that it is imperative to determine whether the Federal role is to become greater or smaller.

If the former course is to be followed, appropriations should be increased, formulas for apportionment of funds should be revised, and a highway-user tax system should be developed. On the other hand, if the Federal role is to diminish, the Government should abandon its motor fuel taxes, so that the states may readily increase their highway revenues, Mr. Zettel said.

In addressing the first luncheon meeting, Governor Walter J. Kohler of Wisconsin expressed the opinion of the majority of state chief executives that the Government should vacate the gasoline tax field and adjust Federal highway aid to states accordingly. He went on to say that such Federal aid has not kept pace with Federal automotive tax receipts.

The subject of state and Federal responsibilities was discussed further during the second panel of the program. Leading off was Ohio Congressman J. Harry McGregor, who stated emphatically that the Government should stay in the gasoline tax field to aid states in carrying out their programs and that the Bureau of Public Roads should be strongly supported in its valuable administrative functions. He expressed doubt that all the states would substitute adequate taxes of their own for highway needs if the Federal gas tax should be dropped.

Ben H. Wooten, Dallas, Tex., bank president, advocated more power centered in the states, but continued general Federal participation, especially as it affects national welfare and defense. Harry I. Storey, official of the Iowa Farm Bureau, showed himself to be one of the most vehement supporters of the states in declaring that all automotive excise taxes should be repealed eventually and the Federal gasoline tax immediately. Whatever general assistance the Government then continues should be financed by general, not gasoline tax revenues, he said. A. E. Johnson, chief engineer, Arkansas State Highway Commission, added that the states should have the prime responsibility for highway programs, although the Government should aid in coordinating them.

Toll Roads

The first speaker on the third panel of the conference, which centered around the subject of toll roads, was Paul L. Troast, chairman of the New Jersey Turnpike Authority. In reviewing the history of the famed 118-mile toll road traversing his state, he pointed to its success as indicative of the fact that toll roads are vital to supplement and compete with free highway systems and should be built through private financing methods.

Charles L. Dearing, Deputy Under Secretary of Commerce for Transportation, expressed his strong sup-

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AND OTHER BALL APPLICATIONS
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BALLS
GLASS • PLASTICS • ALUMINUM • DRILLED BALLS
Precision balls made for your job — available in a variety of materials. Your specifications will receive prompt attention in our Engineering Department. We are thoroughly experienced in supplying the automotive industry with special bearings, retainers and balls. Let us give you our recommendations.
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THE HARTFORD STEEL BALL CO.
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THE WORLD'S MOST TRIED AND TRUSTED
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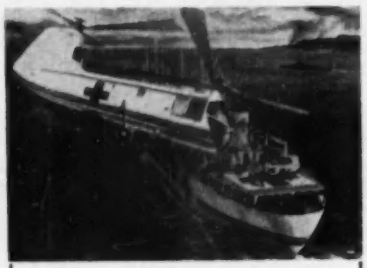
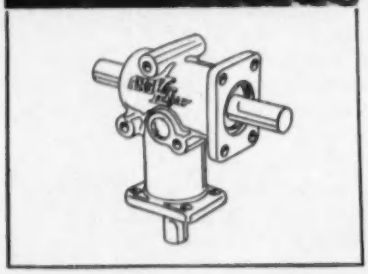
ANGLgear
TRADE MARK

SERVES IN NAVY'S HUP-2





This right angle drive is part of the control system for the fuel shut-off valve. ANGLgear is often the choice when compact design and high capacity are required. These qualities make it a favorite among designers—specified equipment in many aircraft.

Model R-300 is rated at 1/3 hp at 1800 rpm—Model R-320 at 1 hp. Both models have hardened gears and ball bearings, are lubricated for life. Both are made with 1:1 ratio and with 2-way or 3-way shaft extensions.

ANGLgears are described fully in the I.A.S. Aeronautical Engineering Catalog. Refer to this publication for complete information, or write us direct.

AIRBORNE
ACCESSORIES CORPORATION
1414 Chestnut Avenue
Hillside 5, New Jersey

port of toll roads in stating that they afford a sound solution for many of the costly deficiencies on the rural segment of our system of interstate highways. He pointed out the possibility that within a decade about one-third of the total rural mileage on the present interstate system can be improved to acceptable standards through the use of self-liquidating toll projects.

C. C. Hardwick, partner, Smith, Barney & Co., stated that the toll road is a fundamental necessity in the economic development of the nation and that private capital should be available to finance any toll road construction which can liquidate itself within a reasonable period of years. He added, however, that in certain cases the Government may have to step in to aid in financing toll roads needed for the national welfare where private capital is not available.

Walter F. Carey, chairman of the American Trucking Association, while admitting that toll roads meet a current desperate need, expressed strong opposition to them as any sort of long-term solution to the highway problem. Rather, he said, they are symptoms of the highway disease, and not a cure. He expressed fear that the increasing trend toward toll roads would, as a matter of fact, aggravate the general highway problem and retard an overall solution.

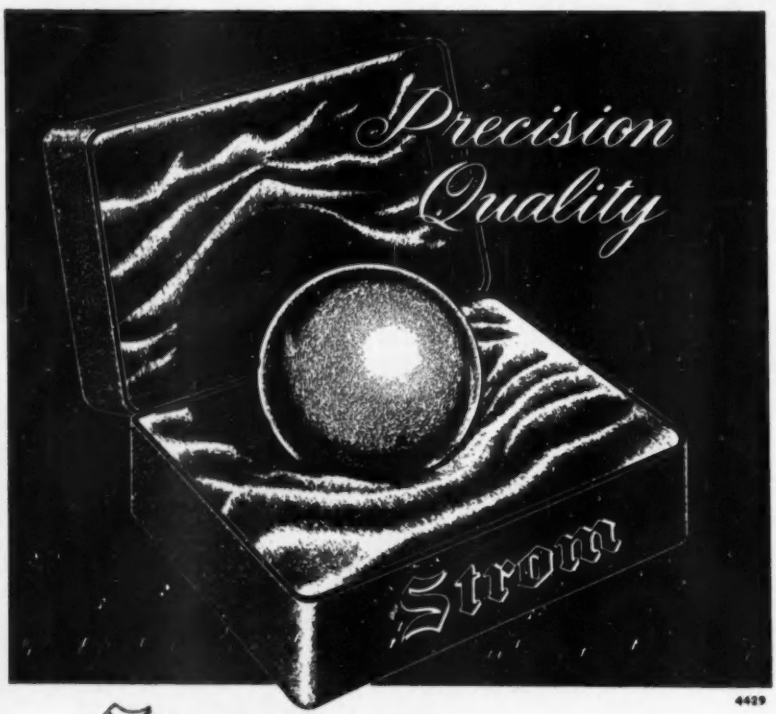
Highway Financing

In summary, the Conference agreed generally that highway difficulties are mainly a money problem and that more should be spent on them. The major responsibility lies with the states, but no real change is expected in Federal outlays.

There was definite apprehension that the states will not fill the gap if the Federal gasoline tax is rescinded and, if it were, the Bureau of Public Roads and Federal Aid might be abolished. The linkage between Federal aid and the gasoline tax is still confused and must be straightened out.

No agreement was reached on how much Federal aid should be, as figures all the way from zero to $2 billion were proposed. Most concurred, however, that any Federal aid should be spent on primary roads.

Toll roads are far from being out



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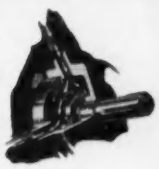
To get more service with less servicing...

replace with **Delco Motors**

THESE FEATURES KEEP DELCO MOTORS GOING LONGER

Water-Tight Conduit Box. Protects against moisture.



Positive Lubrication. Lengthens bearing life.

Delcote Insulation. Permanently flexible, moisture-proof, wear resistant.

Positioned Bearings. Maintain shaft alignment.

Dynamically Balanced Rotor and Shaft Assembly. Reduces vibration.

Corrosive-Resistant Cast Iron Frame. More solid, more rugged.

Compare Delco motors with others. You will discover they have greater endurance under load...require minimum servicing . . . for every type of Delco motor is designed, engineered and built to precision standards inside and out.

Whenever you need replacement motors . . . fast . . . call your local Delco wholesaler. Delco motors are available everywhere for immediate delivery.

THERE'S A DELCO
FOR PRACTICALLY ANY
INDUSTRIAL APPLICATION

Open and enclosed motors up to 100 h.p. for standard foot mountings. NEMA C&D flange-mounted motors up to 30 h.p. Explosion proof motors up to 20 h.p.

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Division of General Motors Corporation, Dayton, Ohio

A GENERAL MOTORS PRODUCT — A UNITED MOTORS LINE

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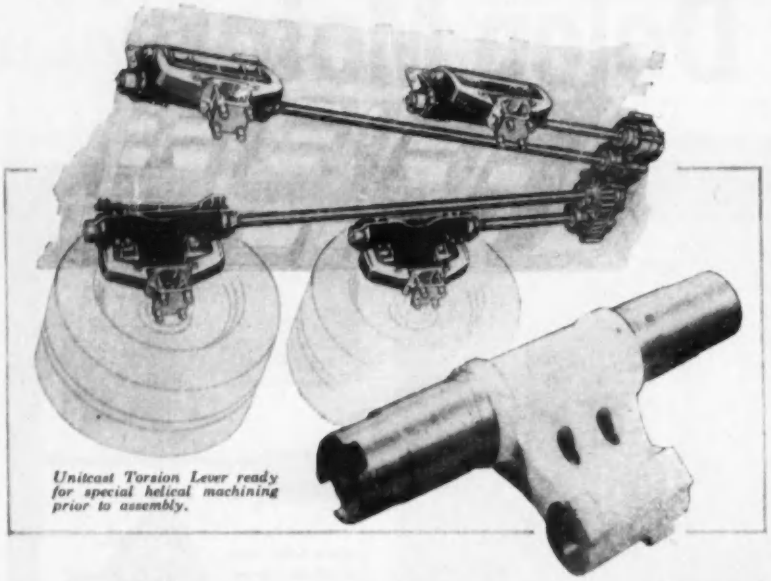
Unitcastings solve tough torsion lever problem!



Unitcast Torsion Lever ready for special helical machining prior to assembly.

..good foundry technique = good castings!

With a primary objective of producing matched pairs . . . *and producing them right*, this Torsion Lever proved a healthy challenge to foundry engineering. End use of this main link between the torsion springs and the axles requires finished castings that are sound, accurate and physically dependable.

Unitcast solved the problem by perfecting a molding procedure especially for this particular job. Individually controlled and synchronized operations produce steel castings "constantly high in quality". As to cost factors . . . delivered, the castings require *no preliminary* machining . . . and one important fit surface is held within tolerances that require *no finish machining at all!* Accepted production to date . . . *over 350,000 units*, is high recommendation of Unitcast's foundry technique!

Are you missing "constantly high quality"? Let Unitcast analyze your parts problems . . . there's no obligation. And, all inquiries we receive for new designs are kept in strictest confidence.

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Unitcast

QUALITY STEEL CASTINGS

of the controversy stage. It was agreed, though, that they do aid in relieving the present highway predicament. Their financing must be subject to strict requirements.

The consensus was that additional income for highways should come primarily from the states and probably through increases in state gasoline taxes. Although no one feasible rate was determined, it was pointed out that such rates in various states range from three to seven cents and that there should be room for increases in some of them.

SHORTIES

Highway users paid $5.3 billion in special taxes in 1952.

•

Taxes took 29 cents out of the automobile sales dollar in 1952, compared with 14 cents in 1939.

•

Thirty-one million families in the U.S. now own automobiles.

•

Three out of every four cars sold in the U. S. in 1952 replaced cars being scrapped.

•

It would take more than six million 100-watt light bulbs to produce light equivalent to that installed in cars and trucks in one year by just one automotive electrical supplier.

•

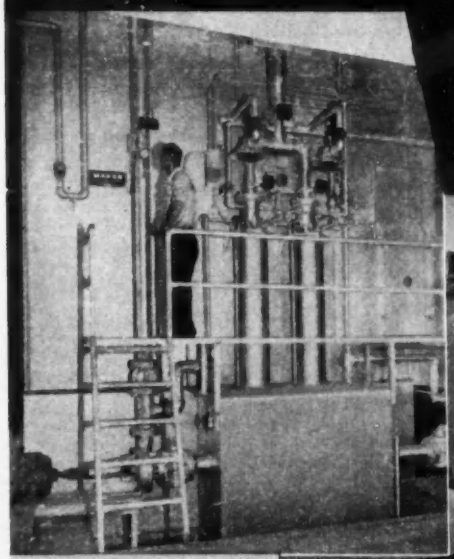
In its short five years of existence, the Military Air Transport Service has achieved a continuing airlift equivalent to carrying every person in the entire state of Kansas, along with 632 million lb of their personal possessions, a distance of 2000 miles to a point above the Arctic Circle.

•

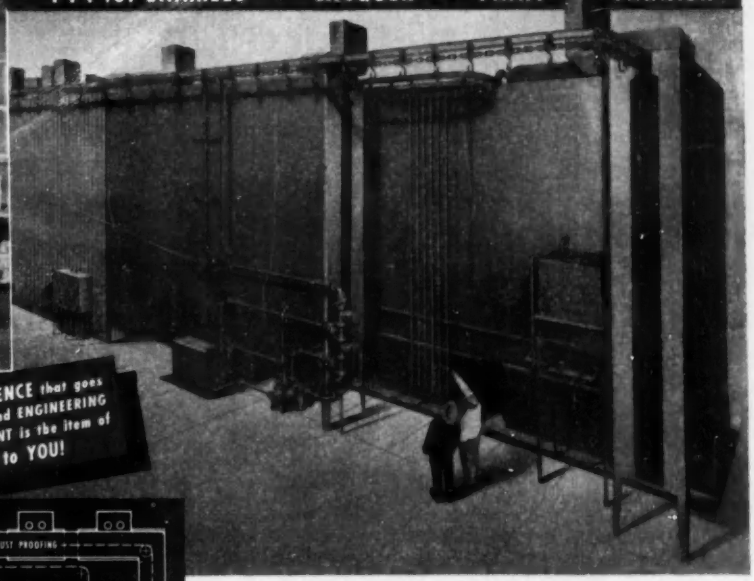
A single U.S. aircraft company has built more than 25,000 aircraft in 21 years. The 322 million lb of metal in these planes would circle the equator with a two-foot wide girdle of metal 1/8 in. thick.

COMPLETE SYSTEMS

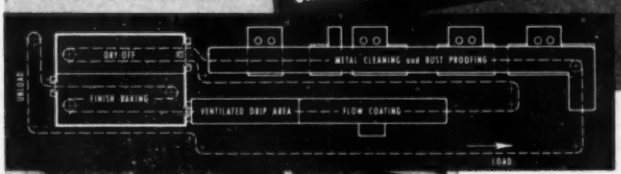
. . . for ENAMELS • LACQUER • PAINT VARNISH



Mahon FIRE-JET Heating Units on the solution tanks of Mahon Five-Stage Metal Cleaning and Rust Proofing Machine—part of the Complete Mahon Finishing System at MULT-A-FRAME Division of Ainsworth Manufacturing Corporation, Detroit, Mich.

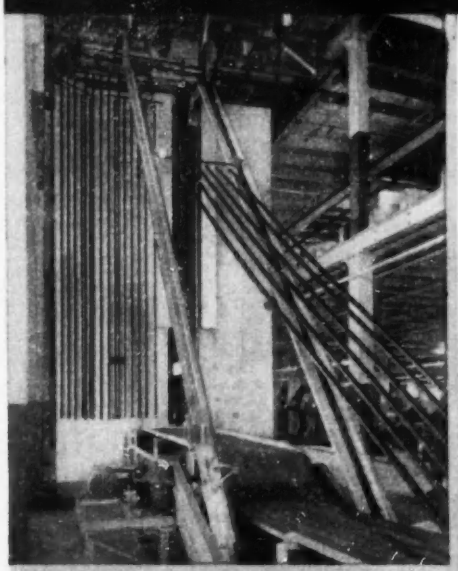


. . . the EXPERIENCE that goes into the PLANNING and ENGINEERING of MAHON EQUIPMENT is the item of GREATEST VALUE to YOU!



Ainsworth MULT-A-FRAME Channels are Painted in MAHON EQUIPMENT!

When the MULT-A-FRAME Division of Ainsworth Manufacturing Corporation was confronted with a finishing problem, they turned to Mahon for the solution. The product is a box channel 20 ft. long with only a ½" slot in one side—these are cleaned, rust proofed and painted outside and inside. Two hundred channels are finished per hour. Thousands of Fittings, Concrete Inserts and other MULT-A-FRAME parts and accessories are also finished on the same line. The finishing equipment extends from a pit in the first floor to the second floor ceiling. Oven Heating Units, Recirculating Fans and Exhaust Fans are located on the third floor. Automatic loaders and unloaders, with ramp conveyors from the first floor, load and unload the main conveyor which is located 27'-5" above the first floor. This is another Complete Mahon Finishing System designed and built by Mahon to do a specific job efficiently and economically. If you have a finishing problem, or are contemplating new finishing equipment, you will find that Mahon engineers are better qualified to advise you on both methods and equipment requirements . . . better qualified to do the all-important planning and engineering of equipment—which is the key to fine finishes at minimum cost. You will also find that Mahon equipment is built better for more economical operation over a longer period of time. Mahon's background history in this highly specialized field covers thousands of Complete Finishing Systems including Dip, Flow Coating and Spray Equipment for every conceivable product painted on a production basis. See Sweet's Plant Engineering File, or write for Catalog A-654.



Exit end of Mahon combined Dry-Off and Finish Baking Oven showing Automatic Unloading Conveyor Ramp and Belt Type Handling Conveyors on the first floor at the Ainsworth Plant.

THE R. C. MAHON COMPANY

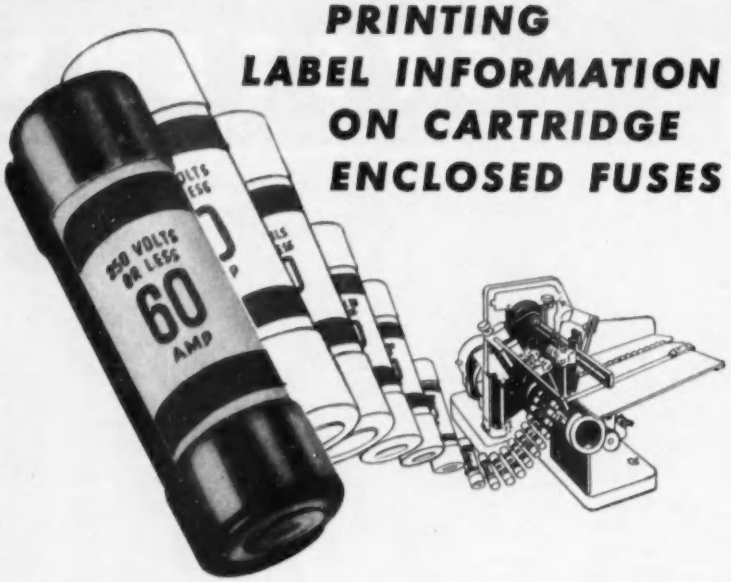
HOME OFFICE and PLANT, Detroit 34, Mich. • WESTERN SALES DIVISION, Chicago 4, Ill.

Engineers and Manufacturers of Complete Finishing Systems—including Metal Cleaning, Pickling, and Rust Proofing Equipment, Hydro-Filter Spray Booths, Dip and Flow Coaters, Filtered Air Supply Systems, and Drying and Baking Ovens, Cooling Tunnels, Heat Treating and Quenching Equipment for Aluminum and Magnesium, and other units of Special Production Equipment.

MAHON

MARKEM SOLVED THIS MARKING PROBLEM

PRINTING LABEL INFORMATION ON CARTRIDGE ENCLOSED FUSES



Working closely with Underwriters' Laboratories, Inc. and with leading fuse manufacturers, Markem has developed a method which makes possible for the first time the printing of label information directly on cartridge enclosed fuses at production rates. Markem's direct ink imprints cannot "fall off" and are unaffected by moisture or ordinary chemical atmospheres. Paper label inventory and wastage problems are eliminated. Print is larger and color coding and identification are simplified. Fuse manufacturers anticipate better labeling at higher production rates and with lower costs. The Markem Method —Markem Machine, Markem type and ink and the special recording die roll for use when UL Manifest is required—as well as the imprint itself meet with UL approval.

MARKEM® MARKS THEM ALL

CAN MARKEM HELP YOU? Printing labels directly on cartridge enclosed fuses is but an example of how Markem solves industry's marking problems. Markem has been providing industry with production techniques and equipment to identify, decorate or designate its products, parts and packages since 1911. Markem also provides technically trained men who are available in your area to assure *continued* satisfaction with Markem methods and equipment.

When *you* have a marking problem, tell us about it and send a sample of the item to be marked. Perhaps a complete Markem method has *already* been developed to solve your problem. If not, Markem will work out a practical solution.

Markem Machine Company, Keene 8, N. H., U.S.A.

MARKEM ...TO MAKE YOUR MARK

CALENDAR

OF COMING SHOWS AND MEETINGS

NADA Annual Convention and Equipment Exhibition, Miami Beach, Fla. ..... Jan. 9-13

Truck-Trailer Manufacturers Association, annual meeting, Boca Raton, Fla. ..... Jan. 11-13

SAE Annual Meeting, Sheraton-Cadillac Hotel and Hotel Statler, Detroit, Mich. ..... Jan. 11-15

National Motor Boat Show, Bronx, N. Y. ..... Jan. 15-23

General Motors Motorama, Waldorf Hotel, New York, N. Y. ..... Jan. 21-26

World Motor Sports Show, New York, N. Y. ..... Jan. 23-31

Plant Maintenance & Engineering Show, Chicago, Ill. ..... Jan. 25-28

Society of Plastic Engineers, 10th annual technical conference, Royal York Hotel, Toronto, Ont. ..... Jan. 27-29

Chicago National Boat Show, Chicago, Ill. ..... Feb. 5-14

International Motor Sports Show, New York, N. Y. ..... Feb. 6-14

National Transport Vehicle Show and Fleet Maintenance Exposition, New York, N. Y. ..... Feb. 17-19

American Society for Testing Materials, spring meeting, Shoreham Hotel, Wash., D. C. ..... March 1-5

SAE National Passenger Car, Body, and Materials Meeting, Hotel Statler, Detroit, Mich. ..... March 2-4

Pacific Automotive Show, Seattle, Wash. ..... March 4-7

Geneva Automobile & Truck Show, Geneva, Switzerland ..... Mar. 11-21

SAE National Aeronautic Meeting, Statler Hotel, New York, N. Y. ..... April 12-15

International Motor Show, Turin, Italy ..... April 21-May 2

ASTE Industrial Exposition, Philadelphia, Pa. ..... April 26-30

American Welding Society, spring technical meeting, Hotel Statler, Buffalo, N. Y. ..... May 4-7

International Aviation Trade Show, New York, N. Y. ..... May 5-7

Annual Foundry Congress and Show, Cleveland, Ohio ..... May 8-14

Basic Materials Exposition, Chicago, Ill. ..... May 17-20

Canadian International Trade Fair, Toronto, Canada ..... May 31-June 11

SAE Summer Meeting, Ambassador and Ritz-Carlton Hotels, Atlantic City, N. J. ..... June 6-11

Society of the Plastics Industry, Sixth National Exposition, Cleveland, O. ..... June 7-11

American Society for Testing Materials, annual meeting, Sherman Hotel, Chicago, Ill. ..... June 13-18

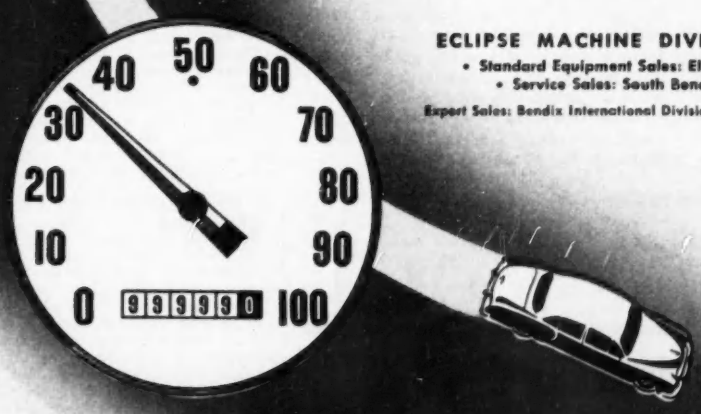
STROMBERG

CARBURETORS

Judge Value As Your Customers Will — on *Lasting Performance!*

The performance of the car you build and sell *today* may very well be the deciding factor in some *future* automobile sale. It is just good business, therefore, to choose your engine components on the basis of *long-range economy*. In carburetors, the name Stromberg is famous for better performance —it is also a fact that Stromberg Carburetors *last longer*. Judge value as your customers will and you will agree— Stromberg* Carburetors are the logical choice.

*REG. U. S. PAT. OFF.



ECLIPSE MACHINE DIVISION OF Bendix AVIATION CORPORATION

- Standard Equipment Sales: Elmira, N. Y.
- Service Sales: South Bend, Ind.

Export Sales: Bendix International Division, 205 East 42nd St., New York 17, N. Y.

Now... let new, extra durable

NU-TEX MOUNTED POINTS

cut your finishing costs to a minimum!

SAVE TIME AND LABOR

With new, longer lasting NU-TEX Mounted Points, you can eliminate filing, scraping, sanding or burnishing . . . grind, polish and deburr all types of metals and plastics in *one* simple operation. Their soft, cushion-like action produces even, extremely smooth finished surfaces quickly and easily . . . makes them ideal for use on all types of precision instruments and machinery.

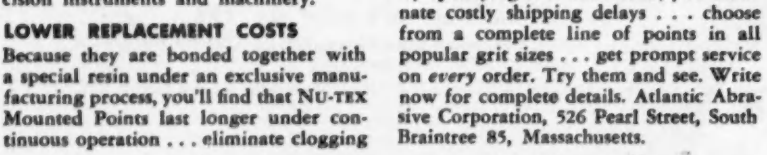
LOWER REPLACEMENT COSTS

Because they are bonded together with a special resin under an exclusive manufacturing process, you'll find that NU-TEX Mounted Points last longer under continuous operation . . . eliminate clogging or loading, even on softer metals. Reliable tests conducted in the Standards Department of a leading automotive manufacturer prove that NU-TEX Points cut downtime to a minimum . . . assure a better polishing and deburring action than any other product of their kind.

GET PROMPT SERVICE

By specifying NU-TEX Points, you eliminate costly shipping delays . . . choose from a complete line of points in all popular grit sizes . . . get prompt service on *every* order. Try them and see. Write now for complete details. Atlantic Abrasive Corporation, 526 Pearl Street, South Braintree 85, Massachusetts.

Good Points to Remember



ATLANTIC ABRASIVE
CORPORATION
South Braintree 85, Massachusetts

Ford Cars and Trucks For '54

(Continued from page 51)

The new Series T-700 and T-800 tandem axle trucks with GCW up to 60,000 lb are factory-built with a front end and frame engineered for tandem operation.

To help meet the 45-ft overall length requirements of most states, two new cab forward series have been added to the line—the C-700 and C-900 Big Jobs. The C-900, with a maximum gross combination weight rating of 55,000 lb, has the largest cab forward capacities ever offered by Ford. New, too, is the 210-in. wheelbase B-600 school bus series.

Included in the 1954 truck line are five basic series: conventional (F); tandem axle (T); cab forward (C); school bus (B), and parcel delivery (P). The five series include a total of 25 basic designations (F-100 pickups, T-700 tandem axle, etc.).

Power steering is offered as optional equipment on all Big Jobs. Fordomatic drive is available at extra cost on all light duty models—F-100, F-250, F-350 and P-350, and power braking is optional on F-100 through Series 500 models at extra cost and as standard equipment on Series 600 models and up.

Ford's power brakes are of a special vacuum-booster design with a cooled reservoir to prevent overheating of the fluid during low gear operation.

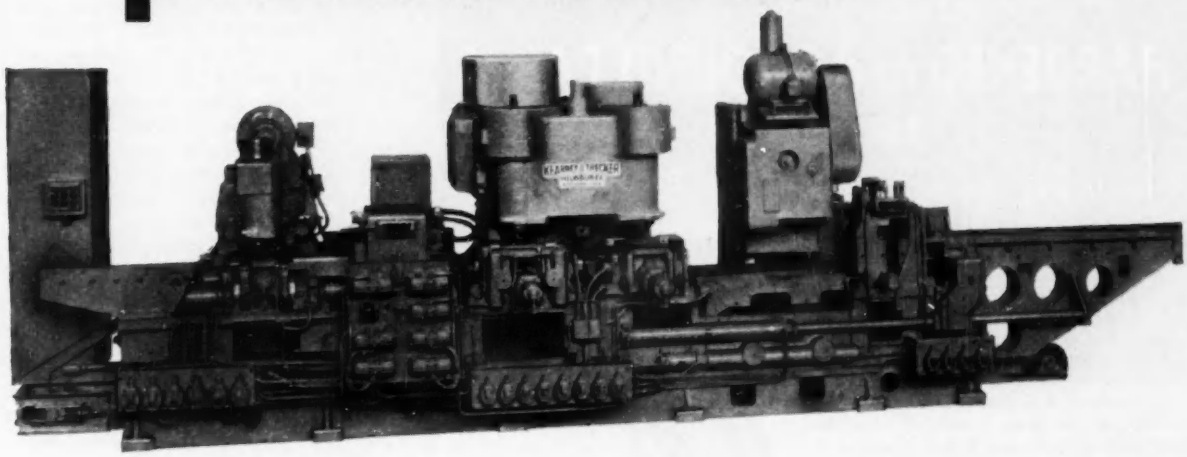
BOOKS . . .

THE UNION CONTRACT CLAUSE FINDER, *published by National Foremen's Institute, New London, Conn. Price, $7.50.* Based upon a painstaking analysis of 3000 union contracts, this booklet presents the best thinking of the outstanding labor negotiators in the country on contract clauses which repeatedly show up in management-union negotiations. It contains not only sample clauses, but a clear and balanced commentary on the aims of both management and labor in the bargaining process.

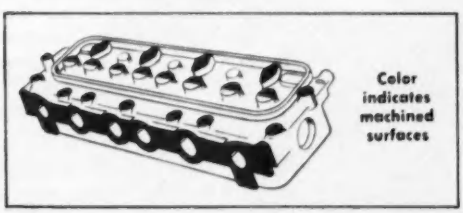
FABRICATED MATERIALS AND PARTS, *by T. C. DuMond, published by Reinhold Publishing Corp., 330 W. 42nd St., New York 36, N. Y. Price, $6.50.* Written in direct style, this book describes 20 major methods of making small industrial parts. Fully discussed are such important considerations as costs, materials used, advantages, limitations, design factors, and the sizes and tolerances possible with each of these methods. All recent developments are covered, and those too new to be thoroughly evaluated are discussed in the light of latest available information.

Talk about production...

Builders of Precision and Production Machine Tools since 1898



For the customer... it put a one-at-a-time rough and finish milling job on a production basis!



Color indicates machined surfaces

THIS special seven-station traveling head transfer type milling machine solved an automotive manufacturer's problem that involved milling cylinder heads. Formerly, rough and finish milling of a six-cylinder head required six distinct machining operations and seven separate handlings. Now, by combining all the machining operations and eliminating handling... the special machine produces 62 finished pieces per hour.

TRAVELING HEADS . . . three heads — one with one spindle and two with three spindles. Full quill adjustment on all spindles. Speeds are fixed. Heads travel hydraulically on hardened and ground ways.

Capacity . . . Experience . . . Performance

Upon completion of this $5,200,000 expansion of our Special Machinery Division, we offer you (1) unmatched facilities, (2) experience based upon more than 50 years in the design and production of special machinery, and (3) performance, best recommended by our outstanding record of successfully solving many hundreds of unusual machining problems.

For more details on this machine . . . ask for *Data Sheet No. 1001.* Free booklet, "Doorway to a proven method for solution of big and small metalworking problems" is also yours for the asking. *Write today to* SPECIAL MACHINERY DIVISION, KEARNEY & TRECKER CORP., 6784 West National Ave., Milwaukee 14, Wisconsin.

KEARNEY & TRECKER CORP. · *Special Machinery Division*
MILWAUKEE 14, WIS., U. S. A.

Fairchild Ready to Buy Assets of Speed Control

Fairchild Engine and Airplane Corp. has formulated final plans to purchase substantially all of the assets of the Speed Control Corp., Wickliffe, O. The latter is engaged in the development and production of devices which provide speed control, both mechanically and electrically, of power output through an infinite speed range from any given source of supply.

Under Fairchild, Speed Control will operate as a separate division at its present location, and will continue to produce all units now on order. Other plans provide that volume production of Specon units will be undertaken at the Fairchild Engine Div., Farmingdale, L. I., New York.

ROCKETS Behind the Iron Curtain

(*Continued from page* 72)

Testing and Production Facilities

With few exceptions, all of the rocket facilities built by the Germans are in the Russian Zone of Germany. The famous German rocket development center at Peenemuende is reported to be back in operation, and at least four different German missiles are reported to be in production.

During World War II, along the Baltic Sea coast from Peenemuende toward Lithuania the Germans built a fine launching range for V-2 missiles, complete with a number of launching ramps, radar and photographic observation stations, salvage- and patrol-boat stations, airfields, and antiaircraft defenses. It is this region that supposedly has been used by the Russians for long-range missile flights, and they have displayed great concern about keeping aircraft and travellers away from this area. However, it is not very likely that the Soviets are actively using Peenemuende or the Baltic Sea launching range. In the first place, these facilities are strategically poorly located as they are within easy bombing range of potential enemy bases. Secondly, there is the possibility that a poorly fired missile might land on Swedish or Danish territory. The Russians would not cherish the thought of their missile secrets falling into the hands of even a neutral country. Thirdly, there are several regions within the boundaries of the Soviet Union which do not have these disadvantages and which have a more favorable climate than the Baltic area. The regions of the Kirghis Steppe or the Gobi Desert would provide a superior launching range, particularly since the missiles would fall on the ground and would not be lost in the sea.

The German V-2 production facility at Mittelwerk was an advanced, bomb-proof plant, which has been reactivated by the Russians.

Conclusion

While this article has been devoted to specific Russian rocket developments, some interpretation of the basic Soviet attitude on disclosing new weapons is in order. It seems that they will not disclose or use new

(*Turn to page* 112, *please*)

Manufacturers of...
HARDENED and GROUND PARTS
for over 40 years

SINCE the day of the duster and goggles, The Brown Corp. has meant highest quality precision parts for the automotive industry. Today, Brown Parts serve trucks, tractors, trailers, buses, axle builders, off-the-road machines and Diesel locomotives. The production methods and facilities we have developed are unexcelled — uniform product quality is assured—deliveries are reliable—service is efficient. Ask any of our long list of satisfied customers throughout the industry.

For further information about our specialized production of hardened and ground automotive and industrial parts, just drop us a note. We invite an opportunity to quote on your work.

Henry W. Brown
PRESIDENT

KING PIN

Parts include . . .
King Pins
Shackle Bolts
Shackle Pins
Brake Anchor Bolts
Countershafts
Idler Shafts
Stub Axle Shafts
Steering Ball Bolts
Beam Bolts and Bolts
5th-Wheel Rocker Shafts
Wheel Studs
Water Pump Shafts
. . . anything in the hardened and ground line, of any analysis steel, up to 4¼" diameter.

THE BROWN CORP.
213 BELLEVUE AVE. SYRACUSE, N. Y.

C. H. Ehlert, 3407 Clarendon Rd., Cleveland • N. F. Spring, 4716 Balfour Rd., Detroit • R. C. Sanderson, 5609 N. Clark St., Chicago • Harry J. Windmiller, 1704 Carlton, Fort Worth • Johns William & Co., 1440 N. Spring St., Los Angeles, Calif. • John B. Hunt, 5611 S.E. Yamhill St., Portland, Ore.

HOW A BIG NAME MANUFACTURER SAVES 80% IN MAN HOURS —PLUS

JOB FACTS:

SIZE—½" diameter, 1½" long

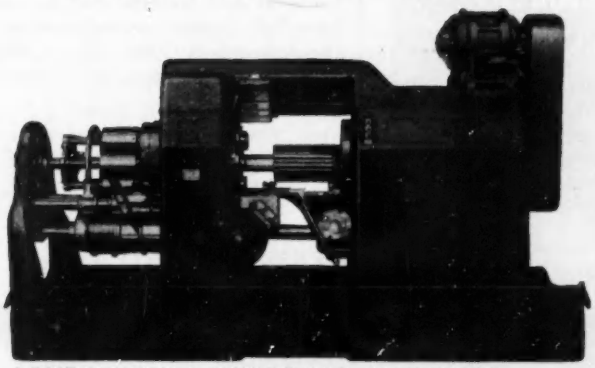
MATERIAL—C-1137 Steel

OPERATIONS—13 including 2 spindle stoppers and pick-off attachment

MACH. TIME—13 seconds

—makes this precision finished steel spindle, completes its 13 different operations in 13 seconds on a 9/16" Acme-Gridley Bar Automatic.

By previous methods the three major screw machine operations required 3 different machines—one for blanking the part, another for milling the spiral oil groove, another for double slotting the end.



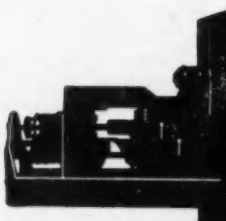
ACME-GRIDLEY 6 SPINDLE BAR AUTOMATIC
Built in 8 different chuck capacities—from 9/16 to 4"

The difference in time for the job—in man hours alone—results in a labor saving of 80%. Value of floor space, cost of extra secondary operation machines, and extra overhead are not figured in.

What "plus" factors? All burrs at oil groove, in slots, on the radiused cut off, are removed on the automatic, by precision shaving the piece all over. The slots are held within .005 of a 90° center line and the collet radius to .0005 concentricity. This single setup eliminates the errors that creep in when it is necessary to rechuck the job, minimizes inspection and scrap loss, insures precise duplication, but adds nothing to the machining time.

At a distance we can demonstrate superior performance only by such examples of completely controlled cycle time and ingenious tooling combinations that apply also to your bar machine work—to save you man hours, reduce your costs or give you a better product. So again we say—

Industry can't do **TODAY'S** job—with **YESTERDAY'S** tools
... and make a profit **TOMORROW**



The NATIONAL ACME COMPANY

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ACME-GRIDLEY BAR and CHUCKING AUTOMATICS
1-4-6 and 8 Spindle • Hydraulic Thread Rolling Machines • Automatic Threading Dies and Taps • Limit, Motor Starter and Control Station Switches • Solenoids • Contract Manufacturing.

(*Continued from page* 110)

armament devices unless they are losing a war. In Finland, Spain, Greece, and Korea, Soviet or Soviet-supported forces have traditionally and repeatedly put old, out-dated armament and equipment in the field, expended poorly equipped troops, and used outmoded airplanes. For example, the MIG-15 jet airplanes which were used in Korea were often reported to be second-rate fighters if compared to newer Soviet aircraft. Only when World War II was going badly for them did the Russians put several new, fully equipped armored divisions into battle, and unveil new tanks and new armament rockets. Any potent new rocket developments or new powerful rocket weapons probably will be closely guarded and kept secret until their use becomes imperative. For this reason it may be a long time before the full story of Soviet rocket developments will become known.

The clues to Soviet rocket development which are reviewed here are meager and of questionable reliability. Nevertheless, they indicate that the Soviets have a good foundation and background in the science and engineering of rockets. They have demonstrated some capabilities in this field and undoubtedly are working, or have worked, on advanced aircraft rocket power plants, on rocket-propelled missiles, and on high-thrust, large rockets for long-range missiles or satellite vehicles. They have had the good fortune to obtain German rocket plant facilities, technicians, and production experience.

The author's interpretations of some important Soviet rocket developments are summarized in Table 4. The available data indicate intelligent and advanced Russian accomplishments in the rocket field. These Soviet developments should not be underestimated.

Packard 212 Hp Engine

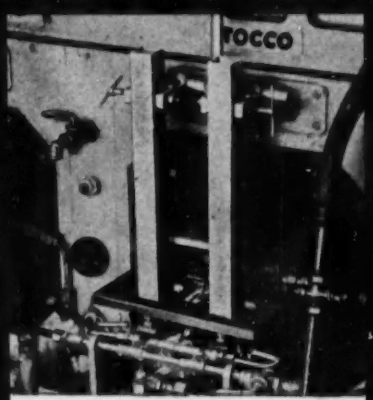
(*Continued from page* 63)

3600 rpm on the Clipper DeLuxe, and at 4000 rpm on the Cavalier and the Clipper Special.

To go with these power plants, buyers may order a standard transmission, overdrive, or an Ultramatic automatic transmission. Completing the selectivity of power combinations, the company offers four different axle ratios.

(*Turn to page* 116, *please*)

Costs down 67%
Production up 400%



TOCCO-brazing drive shaft assemblies—two at a time. Photo—courtesy Mechanics Universal Joint Division of Borg-Warner Corporation.

with TOCCO* Induction Brazing

The shift from welding to TOCCO* induction brazing of the drive shaft assembly pictured here is typical of savings accomplished by TOCCO in over a thousand of America's leading metal-working plants. If you have brazing, soldering, heat-treating or heating for forming or forging operations in your plant TOCCO can probably save you money too.

COSTS DOWN 67%—Mechanics Universal Joint Division of Borg-Warner reports a 67% cost reduction in TOCCO-brazing yokes to tubing in the manufacture of power transmission shafts. Formerly, parts were hand-welded.

PRODUCTION UP 400%—Automatic TOCCO increases production from 11 to 45 pieces per hour—400% faster than former method. In addition TOCCO-brazing produces a cleaner, neater joint than possible with previous method.

TOCCO Engineers are glad to survey your plant, without obligation, of course, to determine where TOCCO Induction Heating can speed your production and cut your manufacturing costs.

THE OHIO CRANKSHAFT COMPANY

TOCCO

Mail Coupon Today

NEW FREE BULLETIN

THE OHIO CRANKSHAFT CO.
Dept. H-1, Cleveland 1, Ohio

Please send copy of "Typical Results of TOCCO Induction Hardening.

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City_____ Zone____ State_____

NIAGARA SHEARS

at General Sheet Steel Co., Detroit, Mich.

NIAGARA

POWER SQUARING SHEARS

after shearing
thousands of tons
of steel
of all kinds

LET'S LOOK AT THE RECORD!

NIAGARA
Shears are designed for
- **HIGH VOLUME SHEARING**
- **ACCURACY**
- **DEPENDABILITY**
- **LOW MAINTENANCE COSTS**

Write for Bulletin 69

NIAGARA MACHINE & TOOL WORKS • BUFFALO 11, N. Y.

Manufacturers of Presses, Shears, Machines and Tools for Plate and Sheet Metal Work

DISTRICT OFFICES: DETROIT • CLEVELAND • NEW YORK • PHILADELPHIA

Dealers in principal U. S. cities and major foreign countries

Best by test—brazing with EASY-FLO 45"

● That's what the Diamond Sales Co. of Kansas City, Mo. says about the assembly of their bus and street car fare box shown below. Here's the complete statement: "We have had many years experience in welding and soldering and find that brazing with EASY-FLO 45 is the best. It is as strong as the parts themselves and warping is held to a minimum. It is cheaper for us and saves us money on the clean up job and takes a good plate."

Thousands of other manufacturers say the same thing about EASY-FLO 45 low-temperature silver alloy brazing. This bulletin tells you why.

BULLETIN 20 gives full details about EASY-FLO 45's unmatched speed, reliability and economy in making strong, clean, virtually indestructible joints in ferrous and non-ferrous metals. Write today for a free copy.

LEFT — Arrows point to the four EASY-FLO 45 brazed joints in the fare box proper which is made of heavy brass or steel tubing. The brazed assembly is chrome plated.

RIGHT — The money vault is made of brass tubing to which the cast bottom and top are brazed with EASY-FLO 45. Chain link pin (top arrow) is also brazed.

HANDY & HARMAN

General Offices: 82 Fulton St., New York 38, N. Y.

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(*Continued from page* 112)

Some detail changes have been made in the Ultramatic automatic transmission which is standard equipment throughout the Packard line on all models except the Cavalier and the eight-passenger cars. Oil holes have been added in the high-range clutch hub and center shaft to provide for more lubrication under certain operating conditions. In addition, the governor control valve and throttle valve control have been suitably modified to fit the new engine torque curve.

Among the new features introduced are tires with squeal-resistant treads. These tires, available as standard equipment on all models, are said to provide better traction and eliminate the squeal on corners. Tubeless tires are offered as special equipment. Recommended pressure for the two new types of tires is 24 lb.

The Packard line has as optional equipment a new four-way poster seat, adjustable to the most comfortable position for the driver. Other options are continued in the cars. These include the Ultramatic automatic transmission, power brakes, power steering, power windows, air conditioning, dual heaters with underseat outlets, and a selection of four different radios.

Ford Car and Truck Engines

(*Continued from page* 55)

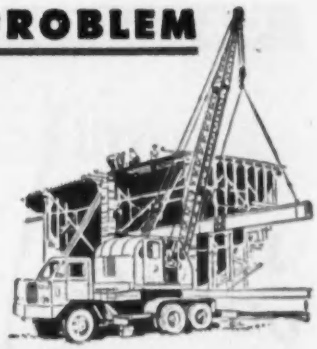
Ford de-popper valve, designed to eliminate the explosions that occur in heavy-duty truck exhaust systems when they decelerate rapidly or descend grades with throttle closed. It takes advantage of the very high vacuum existing under these conditions to reduce the air supply to the idle system. This enriches the mixture to the point where it will not support combustion, thus effectively eliminating explosions at their source. This device also is supplied on the 152- and 170-hp engines.

The dual concentric carburetor, designed especially for the Power King V-8, features a concentric float bowl mounted on stilts directly over the two venturis. The oil bath air cleaner is fitted over the bowl, thus serving to cool the bowl, thereby promoting economy and minimizing vapor lock. The fuel bowl also contains dual curved floats which prevent mixture thinning on steep grades and turns. The carburetor is said to be unique in

ANOTHER POWER TRANSMISSION PROBLEM

SOLVED for SURE

with BLOOD BROTHERS drive line assemblies



Getting real "lugging ability" in soft sand *plus* fast road speeds poses many problems. For years, the builders of Michigan Truck-Cranes and Shovels have solved their power transmission problems with Blood Brothers Drive Line Assemblies.

On this tandem drive machine, three Blood Brothers Assemblies deliver maximum engine torque equally divided between the axles.

When *you're* faced with a power transmission problem, call on our engineers. Chances are, they'll help you "solve it for sure!"

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BLOOD BROTHERS machine division
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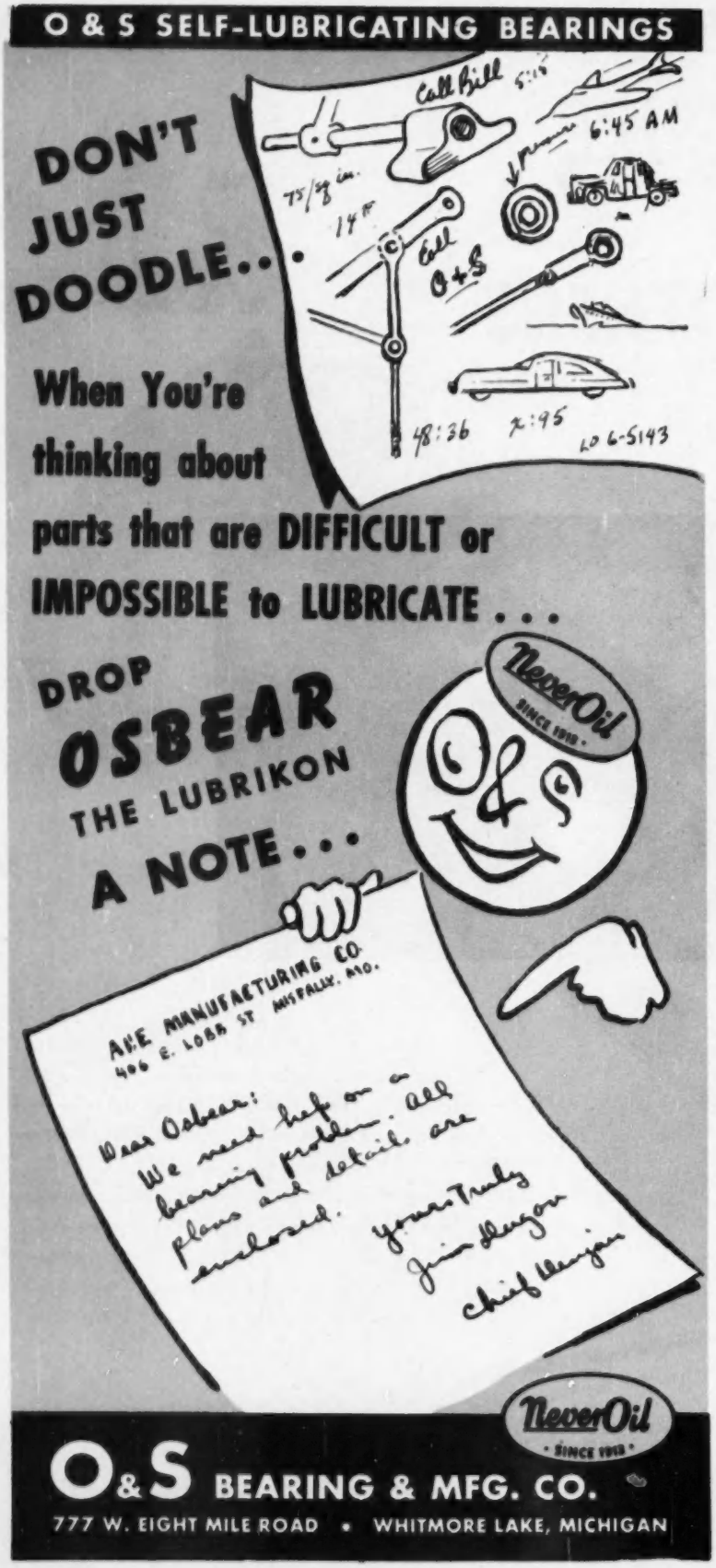
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its compactness and convenient unit construction.

Mention was made earlier of the essential differences between Ford passenger car and truck engines. The following is a list of features found only on truck V-8 engines, as noted: heavy-duty 4-blade fan on 152- and 170-hp engines; heavy-duty flywheel on 152- and 170- hp engines; dual oil control ring only on 152- and 170-hp engines; high alloy exhaust valve seat inserts on 152- and 170-hp engines; low loss ram's-horn exhaust manifold on 152- and 170-hp engines; truck calibrated ignition distributor on 152- and 170-hp engines; Centri-Vac governor on 138-, 152- and 170-hp engines; cobalt-chromium-faced freely rotating exhaust valves on 138-, 152- and 170-hp engines.

The following features are common to all truck engines, regardless of displacement: separate fan and water pump drive; high capacity water pump; high torque, high lift camshaft; dual crankshaft pulley; single point front engine mount; heavy-duty copper-lead main and connecting rod bearings large capacity rear sump; chromium plated top piston ring.

ASME Meeting

(*Continued from page* 50)

lowing periods: turbojet transport, 1958-1962; turboprop transport, 1960-1964.

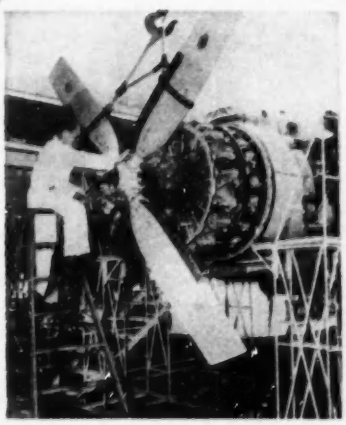
Controls for the Ford-Mercury automatic transmission were explained by R. W. Wayman, of the development laboratory, Warner Gear Div., Borg-Warner Corp. Pressure-regulating devices provide pressures which are adequate and, at the same time, of such values as to produce smooth shifting characteristics. The difficulty of this problem is shown by A, Fig. 2, which indicates the great variety of torque and speed values put into the transmission and which must be taken care of by the control system automatically. Full use is made of the throttle and governor pressures in order to recontrol line-pressure and band-apply-cylinder pressures. The valve, termed the compensator, has governor pressure acting on one end and throttle pressure on the other in order to regulate a pressure varying from 80 psi to zero, dependent upon throttle position and vehicle speed.

This somewhat complicated pressure-relation picture is shown by B in Fig. 2. Note how this compares, particularly in the drive range, with

LORD Dynafocal Engine Mountings

ON THE NEW DC 7

DOUGLAS



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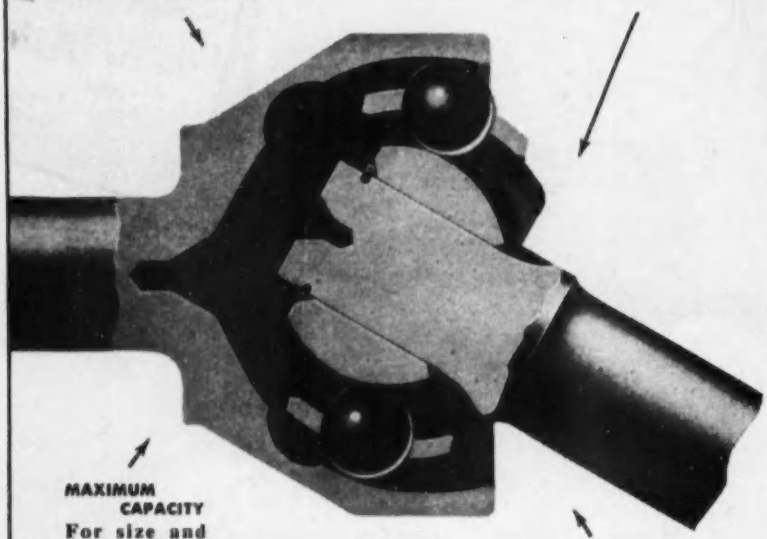

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the converter-output torque as shown in A. Note that pressures are maximum at stall where the converter-output torque is greatest and fall off according to converter output-torque until a minimum of 80 psi is reached.

A practical torque converter drive for main line locomotives could be developed, according to J. S. Newton, vice-president of Baldwin-Lima-Hamilton Corp. He said some theoretical and actual designs compare favorably with Diesel-electric units. Power units should be mounted on the underframe, not on the trucks. Other requirements are constant power at a speed range of five to one or greater, dynamic braking, and multiple operation with present units.

Helicopter drive problems, from engine backfire, oil pocketing, and flywheel ring and fan failures, to bearing fitting, surface finish problems, and gear tooth forms were covered in a paper by W. F. Plume, design staff engineer for Piasecki Helicopter Corp., and a paper by W. P. Robinson, president of W. P. Robinson Co., and J. H. Yost, chief power plant engineer, Helicopter Div., Bell Aircraft Corp. They emphasized that development testing brings out many transmission design solutions previously thought of as failures in other applications, and vice versa.

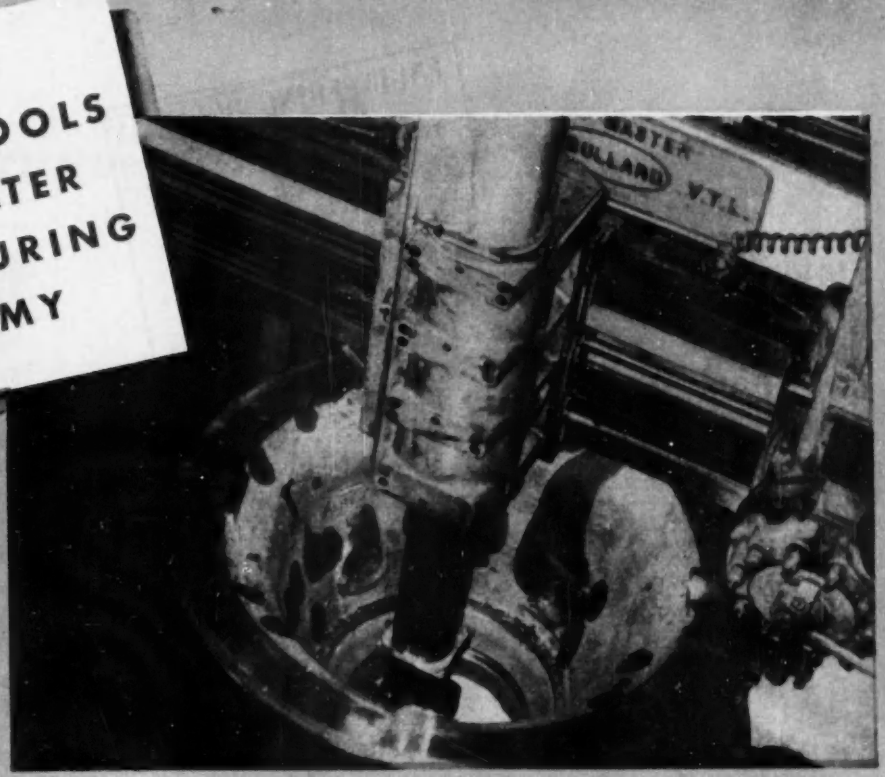
Dies, Cost Cutting, Vibrations

Die designing was defended as a true field of engineering by E. A. Reed, assistant chairman, Industrial Engineering Dept., General Motors Institute, who said time for die design, construction and tryout of irregular-shaped parts such as fenders could be reduced substantially. He recognized there is an economic limit in the use of engineering fundamentals, saying the die engineer must be a craftsman as well.

Cost cutting requires training, according to H. N. Meixner, staff assistant, Development Engineering Div., Du Pont. He described incentive programs, listed potential cost reduction ideas, and showed results of programs in force at Du Pont.

Natural frequency response curves of machine tools, automobiles, aircraft, and many other objects soon will be available to designers, Dr. Rufus Oldenburger, of Woodward Governor Co. told those at the Frequency Response Symposium. He mentioned aircraft flight and engine control problems and others which were solved when the plane's response to excitation by a sine wave generator became available.

BULLARD MACHINE TOOLS FOR GREATER MANUFACTURING ECONOMY



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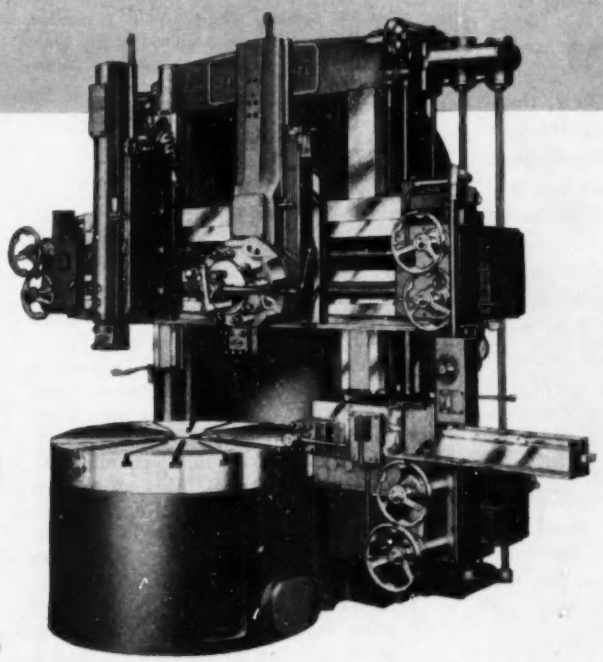

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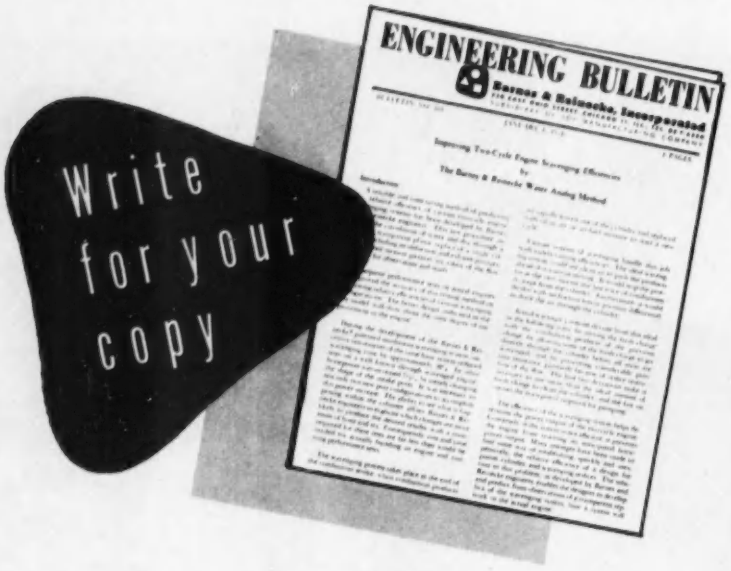


A Barnes & Reinecke METHODS REPORT

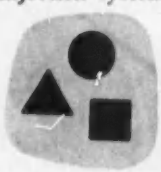
New, faster test of scavenging design for 2-cycle engines

You'll want to read this complete description of a new, time-saving, cost cutting method for predicting comparative performance of diesel scavenging systems. The report highlights a facet of the development work on two-cycle engines recently discussed in an S.A.E. paper by one of the Barnes & Reinecke engineers.

The testing procedure involves duplication, in transparent plastic, of a complete cylinder. Water analog comparisons of various orifice designs are made by simulating gas flow with water and dye and tracing flow patterns as recorded in high speed motion pictures.

Write for illustrated Engineering Bulletin 101. There's no cost or obligation.

Other Barnes & Reinecke developments in the 2-cycle engine field are a heat seal, injection nozzle cooling, and a multi-fuel injection system. We may be able to take over, or speed up, some of your own engine work. Why not outline your problems, let us show you . . . without obligation, of course . . . how our experience may apply?



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AUTOMOTIVE ENGINEERING—MECHANICAL ENGINEERING

Research • Development • Testing • Prototypes

Plastic Trailers

(*Continued from page* 65)

Marco Method, developed by the Marco Products Department of Celanese Corp. This process permits the introduction of resins between molds by vacuum, pressure, or a combination of both. This allows production of a one-piece tank and, in addition, eliminates porosity.

A special frame, developed by Trucktor Corp in cooperation with General Tire & Rubber Co., provides for air suspension, rather than the usual springs, and instant-action electrically controlled brakes.

Lay-up of this new Celanese polyester resin tank included, besides Fiberglas cloth and mat, a two-in. ply of balsa wood, which, in combination with the plastic, provides excellent insulation; and a thin inner tank of stainless steel. After preparation, using these various materials, Marco resins were drawn into the wooden mold. Following a short curing period, the tank was lifted from the mold in one piece.

Supporting skirts running the full length of each side, as well as wiring for lights, were molded in place as an integral part of the tank. Silvery paint, applied to the mold preceding resin application, adhered to the tank, thus eliminating the need of a finishing job.

Completely New Buicks

(*Continued from page* 62)

ing on Series 40 is changed to allow mounting of the starting motor on the right side.

The torque converter planetary gear set has been redesigned in detail along the following lines: gear teeth form has been altered to increase contact ratio of mating gears while the number of teeth has been changed to provide a hunting tooth combination without affecting gear ratio; the sun gear is redesigned to effect a more flexible connection with the stator free-wheel cam, using an intermediate yoke; four oil grooves are cast in the thrust face on the back of the second turbine to improve lubrication and reduce wear.

Steering linkage is of parallelogram type with linkage ratio reduced to 1.13 to 1. Accordingly, overall steering ratio is reduced to 24.1 to 1 with power steering and 26.7 to 1

(*Turn to page* 128, *please*)

This strange design means...

windshields and fixed windows

that *never* leak!

That peculiar image above *might* be anything. Just *look* at all those sharply cut and rounded convolutions! Actually it's a cross-section, greatly enlarged, of Inland Self-Sealing Weather Strip, used on the windshield of a popular passenger car. And the curves, flat surfaces, corners and angles are *precisely* designed, dimensioned and produced . . . *to assure complete and permanent leak-proofing!* No leaks at *all* . . . *ever!*

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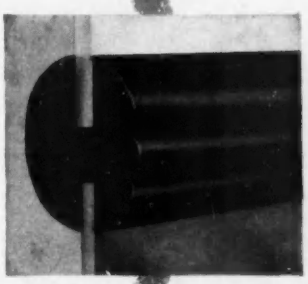
Here's how it works!

One of the simplest forms of Inland Self-Sealing Weather Strip is shown here. The Strip goes into the body panel or other opening. Then the glass goes into the Strip. Then the over-size filler strip goes into the locking channel, expanding it, compressing the whole Inland Self-Sealing Weather Strip into a complete and permanent leak-proof seal!



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General Motors Corporation • Dayton, Ohio

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Two new bessemer converters are another example of Great Lakes Steel's readiness and ability to serve its customers in 1954.

Their job is to refine molten pig iron for the open hearth furnaces Great Lakes uses to make fine steel. This new installation doubles the capacity of the plant's bessemer facilities and contributes importantly to efficiency and quality in steel-making.

Big in themselves, these 25-foot high bessemers are only a small part of the major "tooling-up" we've been doing at Great Lakes Steel. A new blast furnace, a new slab mill, new coke ovens—all are part of a program which now assures automotive and other manufacturers of more high-quality flat-rolled steel. All together, our enlarged and balanced facilities give us an annual capacity of *four million ingot tons.* And that's good because Great Lakes Steel was set up in the first place to provide industry in its area with a *dependable first source* of sheet, strip, and other shapes used here in vast volume. We've become that source largely because of our *integration* as a steelmaker. We start right with the ore, and work it through blast furnaces, bessemers, open hearths, blooming mills, hot and cold rolling mills and merchant mills, down to the finished forms. That gives Great Lakes flexibility that lets us do a real job.

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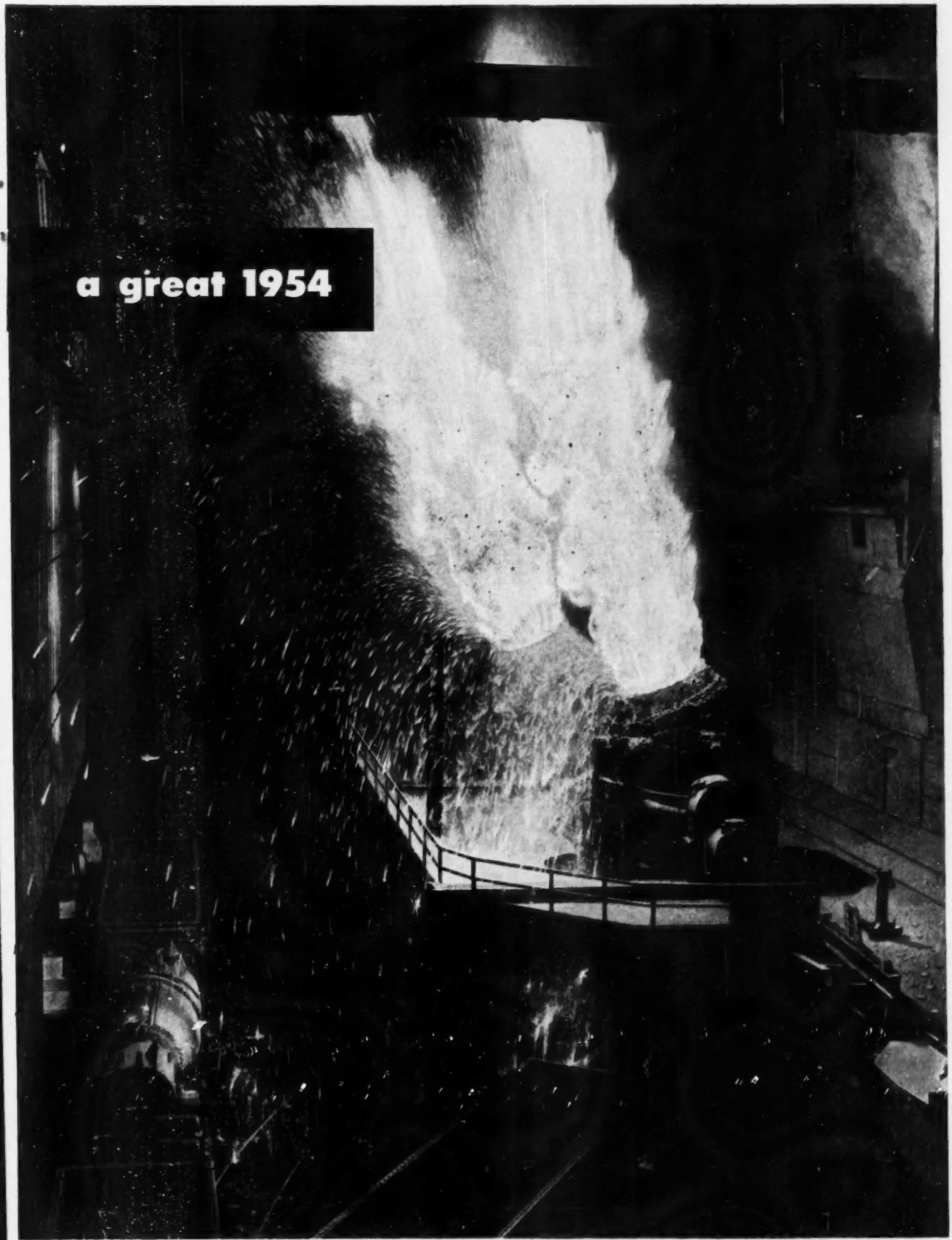

Illustration: Bessemer converters, Great Lakes Steel.

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Defense Dept. Issues Information Pamphlet

All principal buying and contracting offices of the armed forces, including joint-service agencies, are listed in a new Government pamphlet entitled "How to Sell to the Dept. of Defense." Purpose of the publication is to give manufacturers and other potential suppliers of defense materials and services the basic information on military buying methods and items wanted.

Accompanying this new pamphlet is a second one called "Purchased Items and Purchasing Locations of the Dept. of Defense." It provides a cross-reference between general classes of commodities and the procurement offices responsible for buying them. This pamphlet also tells how to get bid invitations and requests for bid proposals.

Businessmen may obtain both pamphlets at any buying office of the Army, Navy, Marine Corps, and Air Force by sending a post card request or making a personal call.

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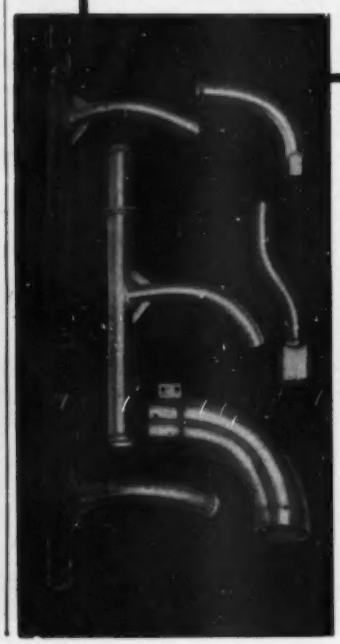

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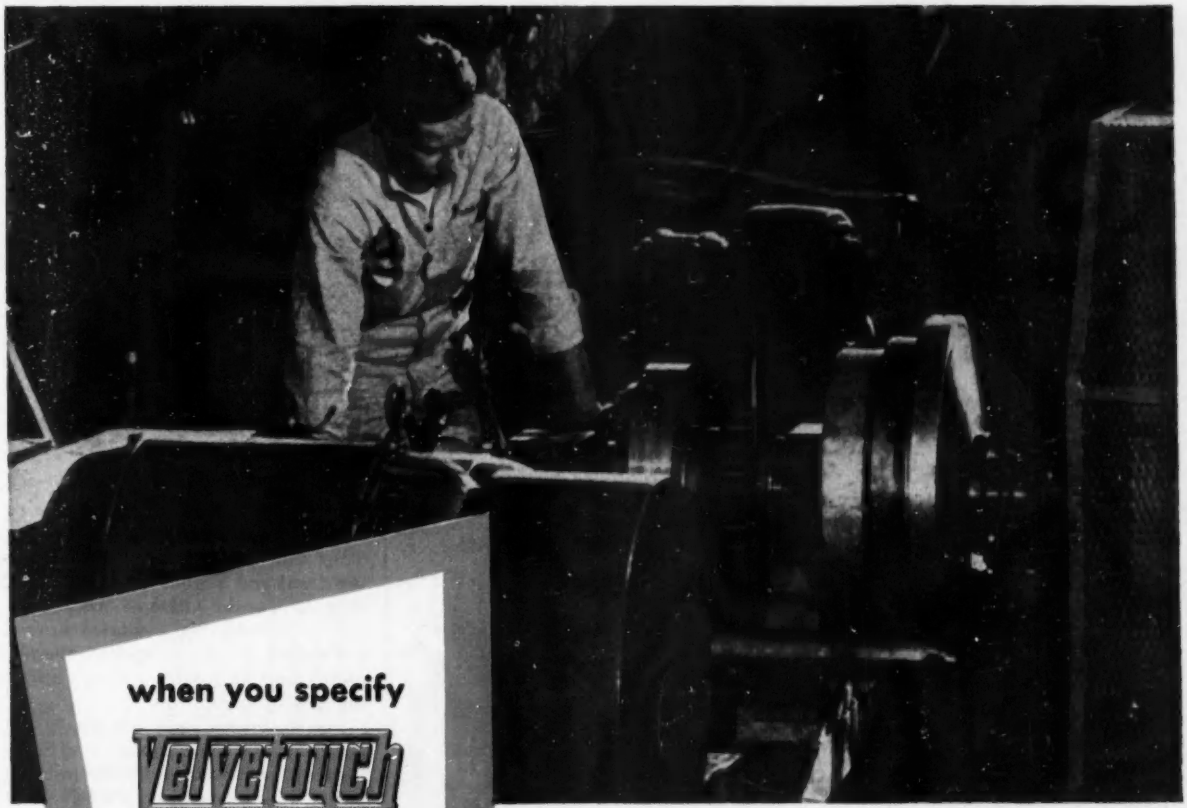

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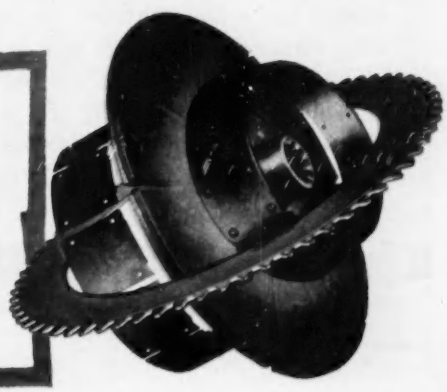
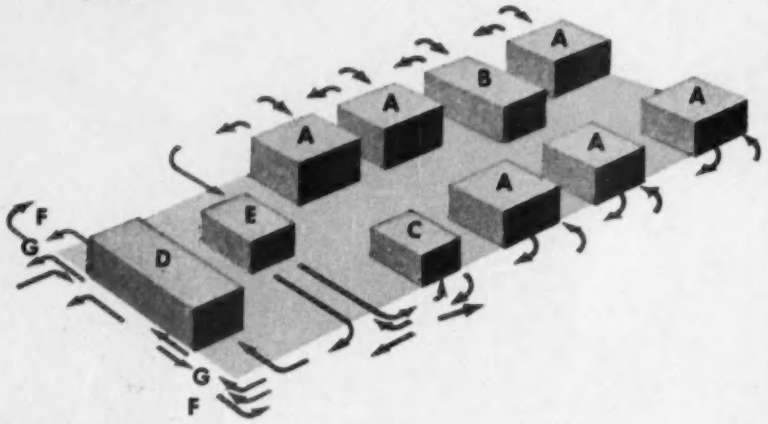


Heat Treat Furnace Layout

by Holcroft ...5th of a Series



A 6 BATCH TYPE FURNACES
B 1 HOT SALT QUENCH
C 1 BATCH TYPE DRAW FURNACE
D 1 CONTINUOUS DRAW FURNACE
E 1 WASH MACHINE
F 2 TWO-WAY TRANSFER CARS
G 2 LOADING ELEVATORS

Multiple Batch Furnace Layout for Any Type of Heat Treating

This unusual furnace layout processes a number of parts requiring different types and cycles of heat treating. It is completely flexible.

The furnaces are now being installed in a midwestern plant, a decision made because captive heat treat departments—where high volume production is a "must"—are definitely economical.

Yes, the initial cost is high. After all, they are capital goods items. But, when all the returns are in, actual per-piece heat treating costs will be substantially lower!

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(*Continued from page* 122)

with manual steering, the same linkage being used in both instances. In brief, the linkage, as illustrated, has a bracket with a threaded bearing mounted on the side rail opposite to the steering gear. An idler arm, torqued to the bushing and pivoting about the bracket, is caused to follow the same motion as the pitman arm, the pitman arm and idler being connected by a tubular center link. Sockets for the pitman and idler arm ball studs are spring-loaded to provide for wear adjustment. Anti-kick springs also are fitted on the pitman arm ball stud to eliminate wheel fight.

The new steering linkage is said to provide practically zero toe change through the ride and rebound range of the front suspension. It is also said to give better directional stability.

Front end suspension on all series is new. It incorporates direct acting shock absorbers mounted vertically within the coil springs and attached directly to the frame and lower control arm spring seats, thus making them independent of the springs. They can be replaced without affecting front end alignment. In adopting this change, the angle of the suspension system has been rotated around the centerline of the spring, thereby increasing wheelbase without affecting frame length.

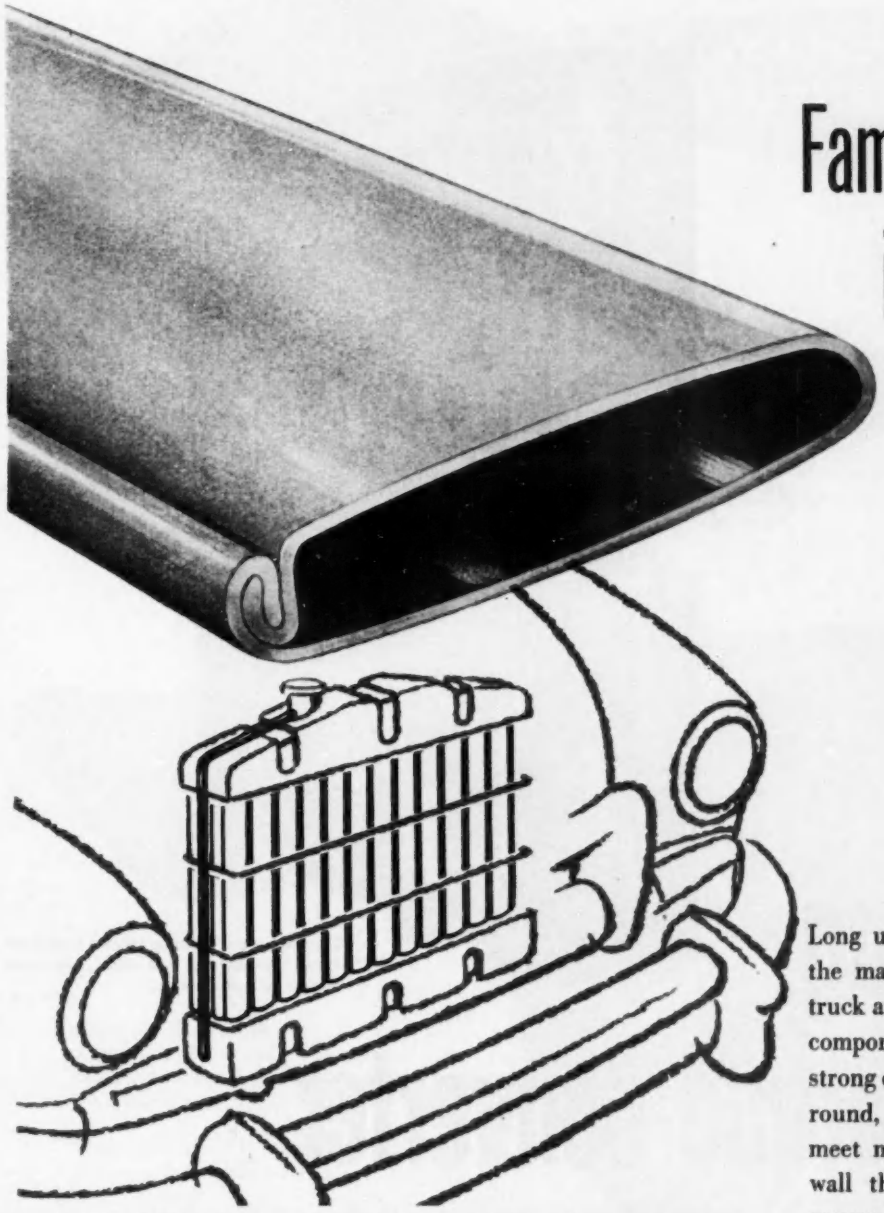
Power brakes are completely redesigned and come equipped with an electrically driven auxiliary vacuum pump. It is mounted on the left front fender skirt.

An improved air conditioner, available as extra equipment, features 25 per cent greater air flow, with a larger evaporator. Life of the air compressor has been increased by the addition of a solenoid-operated clutch which disconnects the compressor from the drive pulley when the air conditioner is turned off.

The Estate Wagon is entirely new in styling and is of all-steel construction. It is available only in the 40 and 60 Series, the body from the rear door hinge pillar forward being similar to the 40-60 Series sedan.

The hypoid gear semi-floating rear axle, with 59-in. tread, having a differential assembly of the type introduced on late production 1953 Series 40, is used on Series 40 and 60 models. Similarly, Series 50 and 70 employ the hypoid gear semi-floating rear axle with 62.2-in. tread introduced in late production in 1953.

Tubular strut rods similar to the 1953 Series 40 design, modified for underbody clearance, are used on Series 40, 50, 60, and 70.



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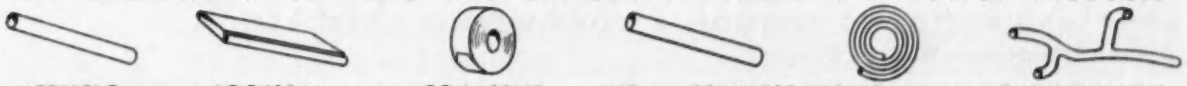
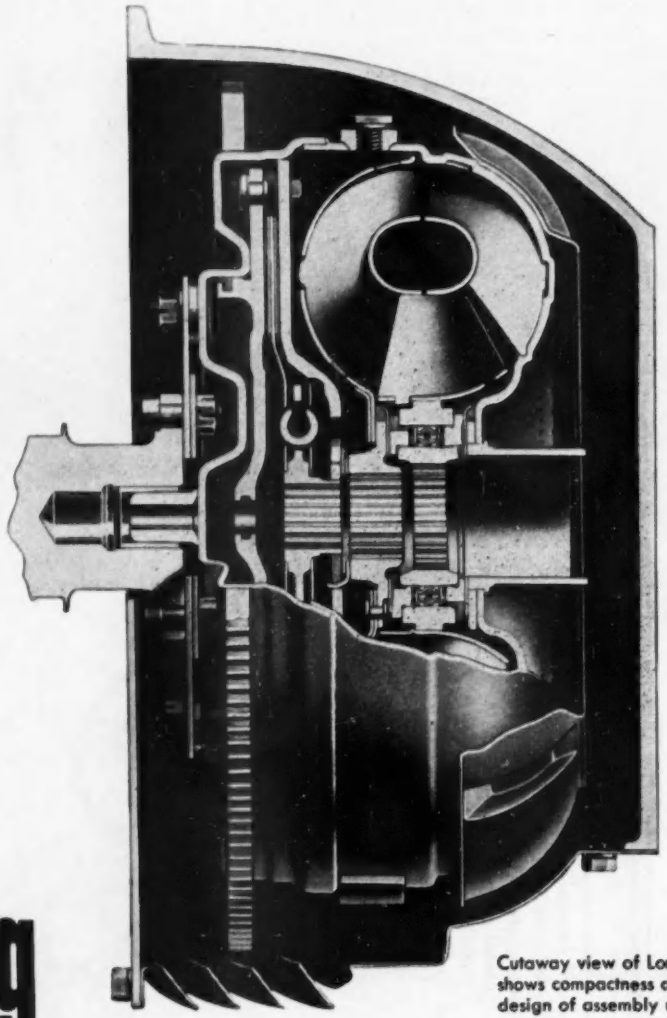


METALFLO LOCKSEAM COIL STRIP AND SEAMLESS TUBING TUBULAR PARTS



Cutaway view of Long torque converter shows compactness and clean, functional design of assembly units.

the Long torque converter

50 Years of Quality Manufacturing for the Automotive Industry

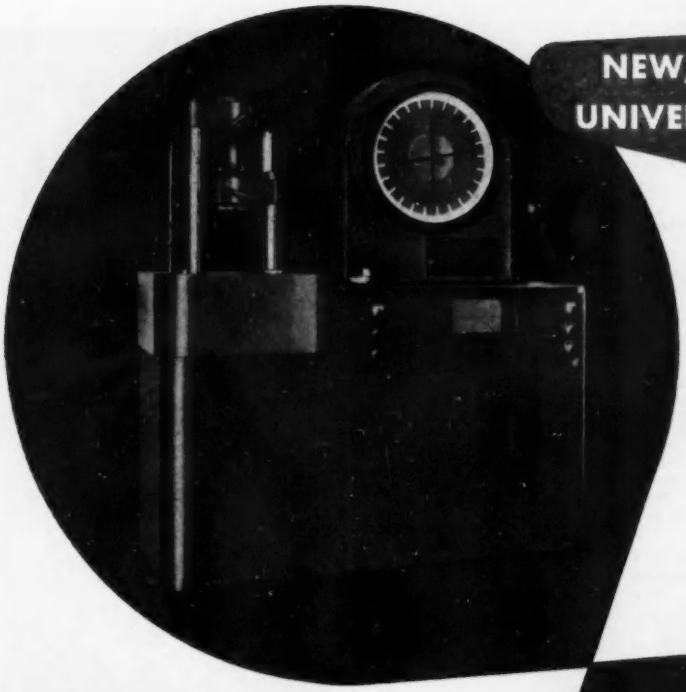
LONG

It combines simple design, low-cost manufacture and high performance. Fabricated almost entirely from stampings. Direct air-cooled for simplicity. Torque multiplication of 2.1 to 1 at stall. Now in production for passenger cars and industrial applications.

LONG MANUFACTURING DIVISION • BORG-WARNER CORPORATION
Detroit 12, Michigan — Windsor, Ontario

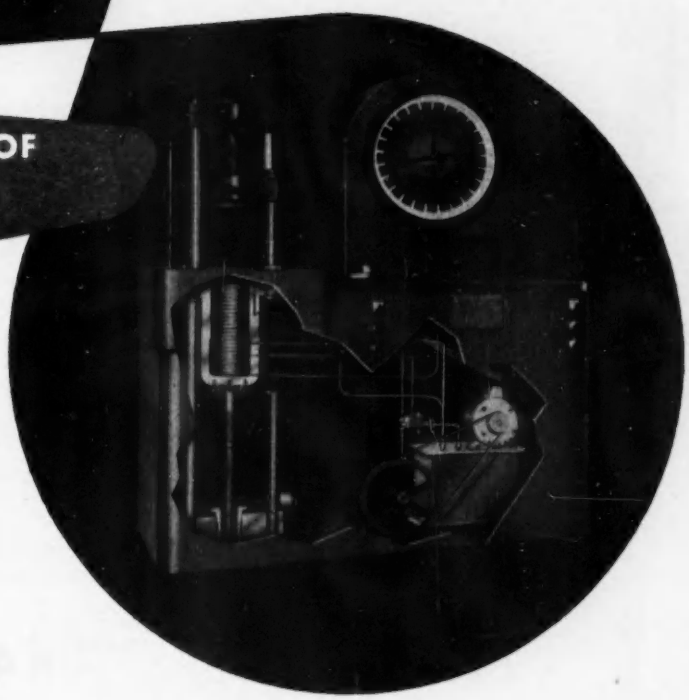
TORQUE CONVERTERS • CLUTCHES • RADIATORS • OIL COOLERS

NEW, COMPACT SINGLE UNIT UNIVERSAL TESTING MACHINE



- Built as a single unit so that floor load is distributed over large area.
- Overall dimensions less than two unit machine (only 67½" wide by 27" deep).
- More compact machine (indicator only 77½" high and loading cage 73¼" high).

WITH ADVANTAGES OF TWO-UNIT DESIGN



- Gage panel is supported separately by a framework which extends to the floor, preventing the shock of breaking specimens from being transmitted to the load indicator.
- Therefore, recoil is not transmitted to the indicator and cannot jar the maximum hands out of position.
- Friction of the maximum hands can be adjusted to the maximum necessary for accurate indication.

This low-cost Baldwin 60-H universal testing machine of 60,000 lb. capacity has many other advantageous features. For complete technical information please write for Bulletin 4204 to Dept. **2104,** Baldwin-Lima-Hamilton Corporation, Philadelphia 42, Pa.

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Bendix Builds a Better *cable clamp* the AN3057B

Inexpensive • Efficient • Versatile

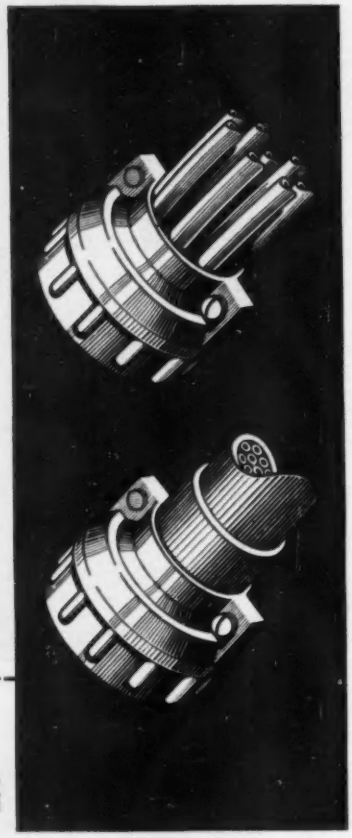
The new Bendix AN approved AN3057B cable clamp is now available. Engineered by Bendix to the highest quality standards, this cable clamp offers major design improvements. The clamping action is radial and completely eliminates wire strain and chafing by holding the wire bundle firmly in rubber. This clamp will accommodate a wide range of wire bundle sizes, but an even greater range can be handled through the use of the Bendix AN3420A accessory telescoping sleeve.

The new AN3057B cable clamp will also waterproof multi-conductor rubber covered cable on the rear of a connector, or where moisture-proof entrance through a bulkhead or into an equipment box is required.

This versatile clamp is a product of the Scintilla Magneto Division of Bendix Aviation Corporation and is a companion AN accessory to the world famous Bendix Scinflex line of electrical connectors. Write our Sales Department for details.

Outstanding Features

- Neoprene gland.
- Centered clamping action.
- Increased close down.
- Positive grounding feature.
- Cadmium plated die-cast aluminum nut.
- Shorter over-all length.
- Waterproofs multi-conductor cable.
- Immediate delivery.



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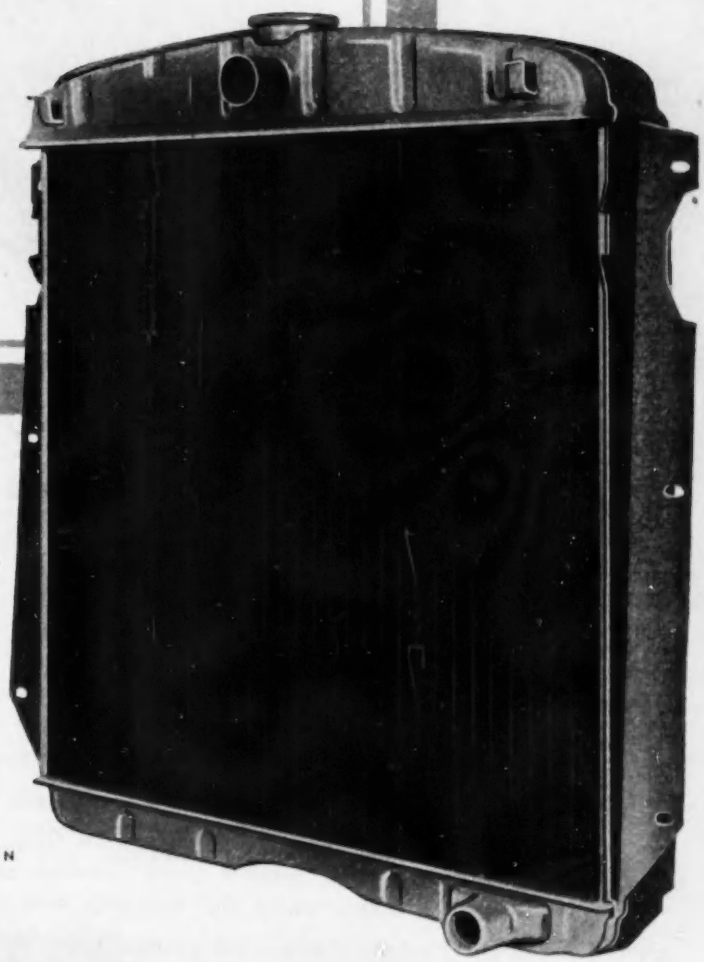

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DIVISION

GENERAL MOTORS CORPORATION
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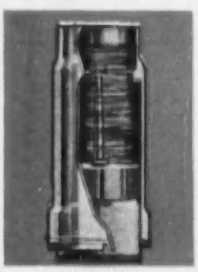
HARRISON

Gentle restraint on a 3-ton knee

keeps a shock absorber from being shocked



It is easy for the big 6600-pound landing gear we build for the B-36 bomber to absorb the impact of the 180-ton aircraft as it lands at 100 miles an hour.

Unfolding the gear for a landing is eased by a small shock absorber which gently cushions the knee of the big shock absorber (aircraft landing gears are just *big* shock absorbers). This restrains the knee from "slamming home" (as engineers term it) when it locks.

If you are plagued by severe shock in machines or apparatus you build, or if tiny flutter in your device tends to build up into large destructive waves, it will pay you to talk with us. Some vibration and impact problems are so complex that they require shock absorbers to cushion the shock absorber. But we believe no impact problem is so complex that it can't be solved. Write for descriptive booklet D-11.

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Tool Company CLEVELAND 5, OHIO

Department G-1

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AIR-OIL IMPACT ABSORBERS

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To MOVE with less EFFORT

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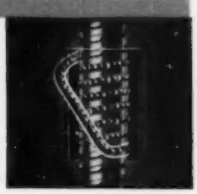
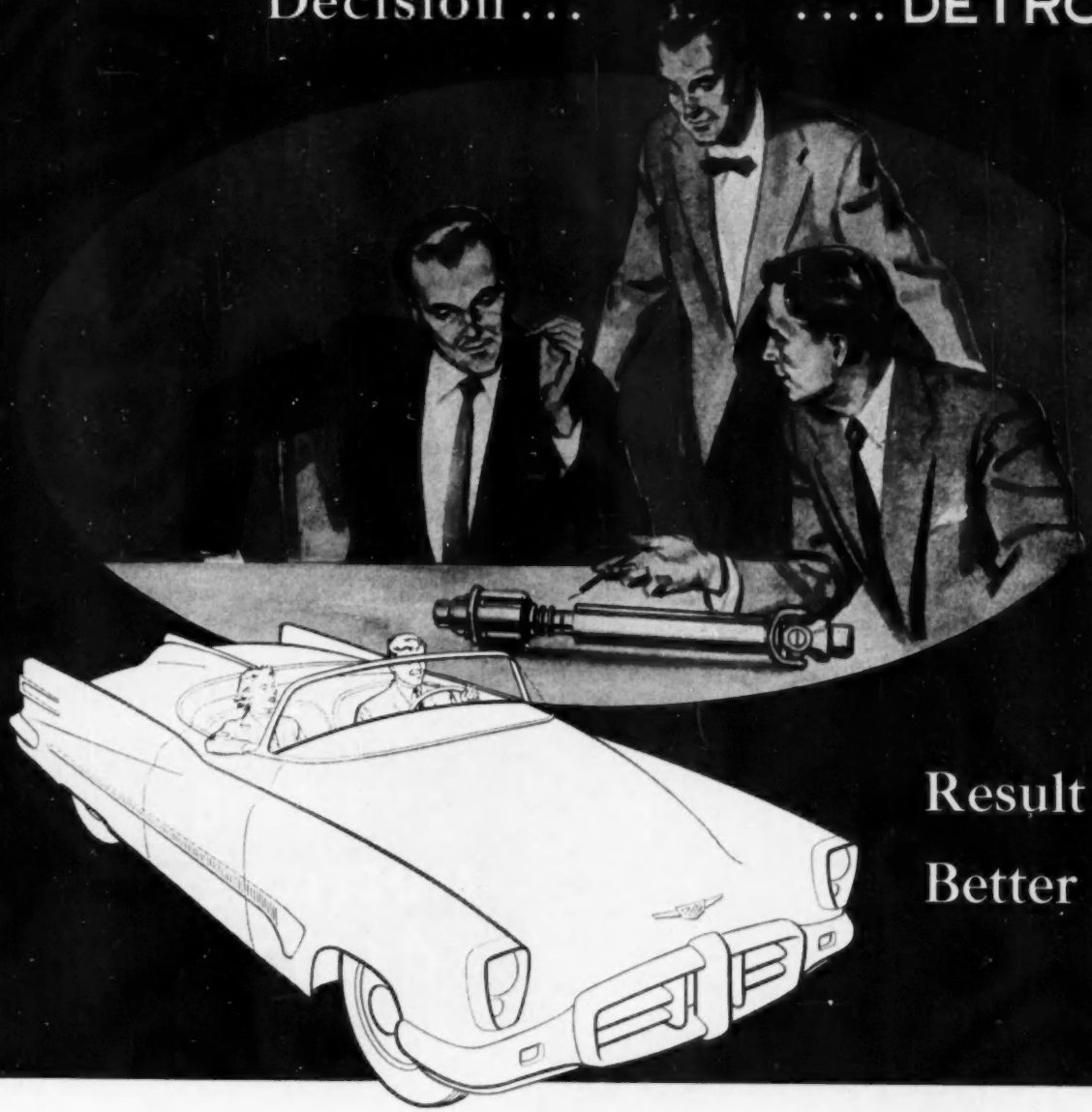


Decision . . . . . DETROIT®



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"DETROIT" joints have vastly improved propeller shaft operation.

Anti-friction slip motion, angular motion and length changes are accomplished *without splines. Without spline friction,* thrust loads on transmission, axle, bearings and suspension are negligible.

Result: A better riding automobile—longer life for the entire drive train.

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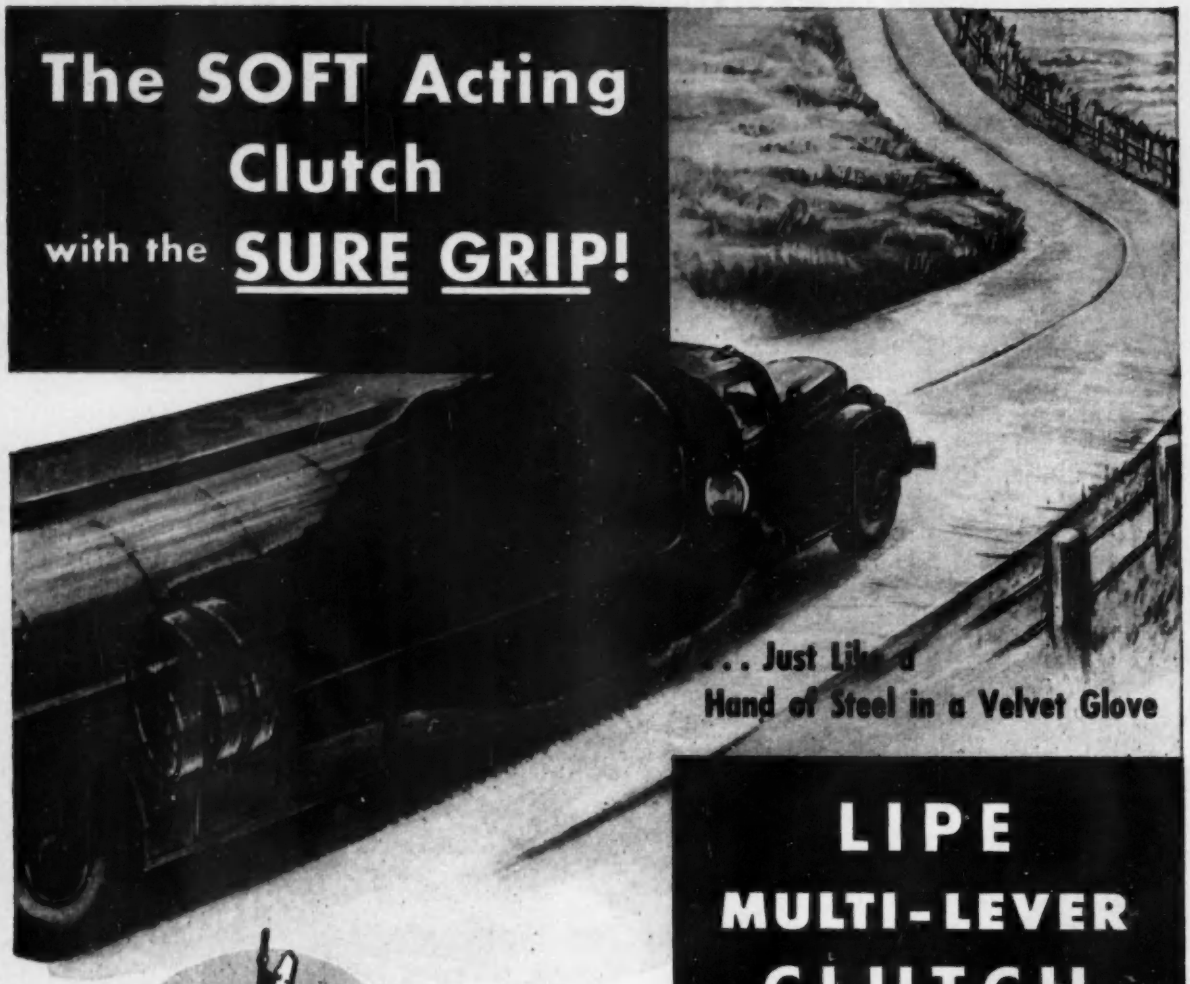
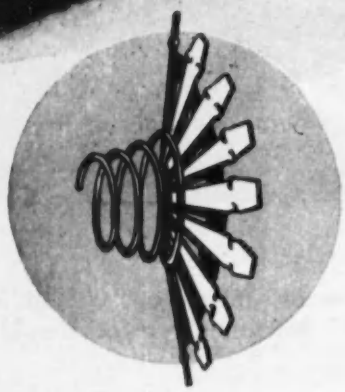


. . . Just Like a Hand of Steel in a Velvet Glove

LIPE MULTI-LEVER CLUTCH



The hand of steel in the Lipe Clutch has 20 fingers that equalize the pressure of a single spring—assuring softer engagement and a positive grip.

Lipe's soft engagement, positive grip Multi-Lever Clutch never needs babying. It engages smoothly—without grab, shock or jerk. All parts of the pressure plate touch at the same instant with the same pressure. No cocking—no point of high slippage and spot burning.

Result: More mileage between tear-downs.

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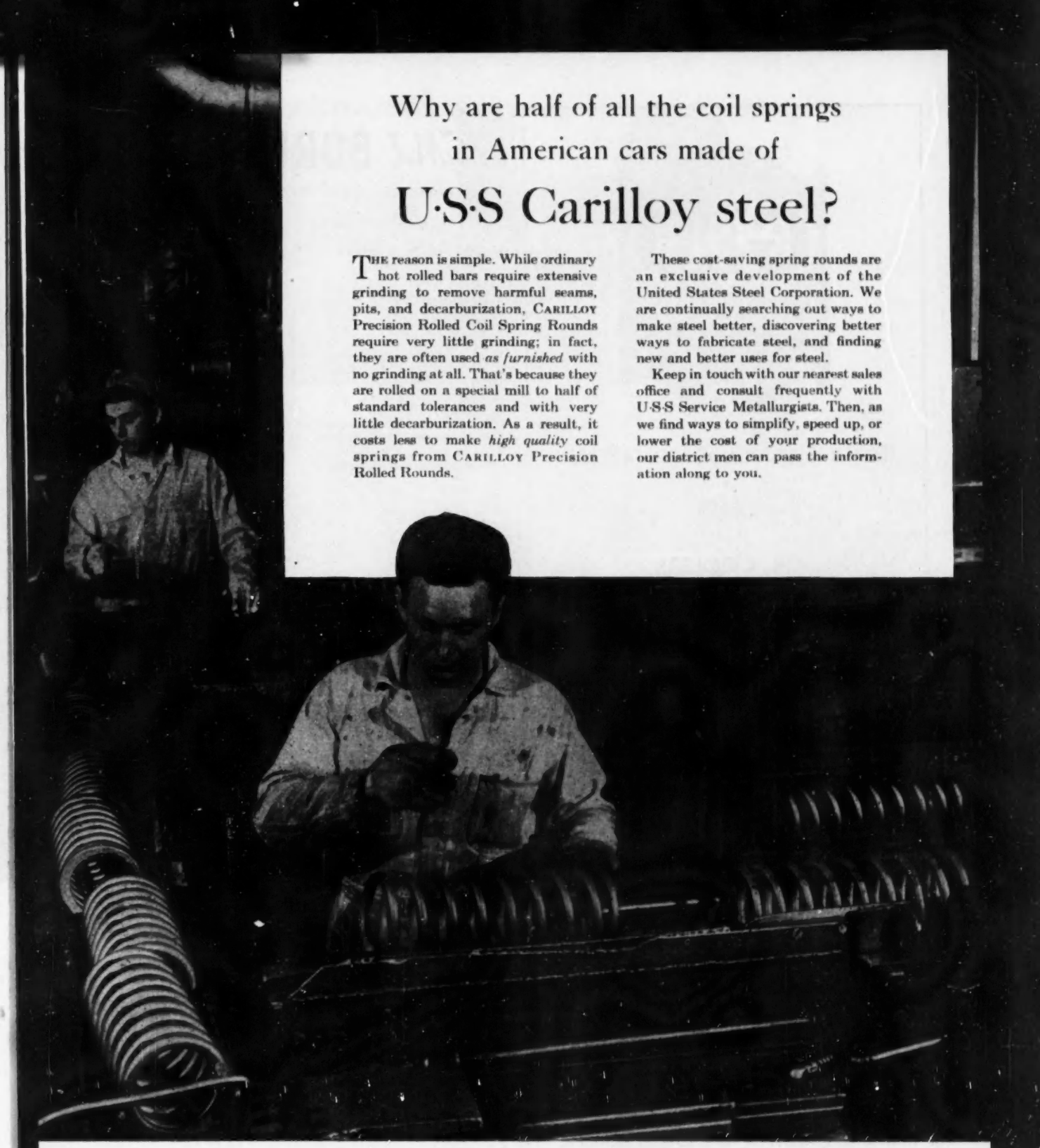

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These cost-saving spring rounds are an exclusive development of the United States Steel Corporation. We are continually searching out ways to make steel better, discovering better ways to fabricate steel, and finding new and better uses for steel.

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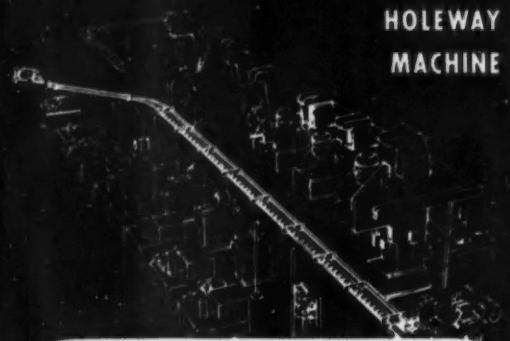

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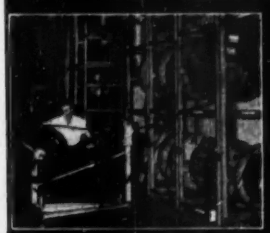

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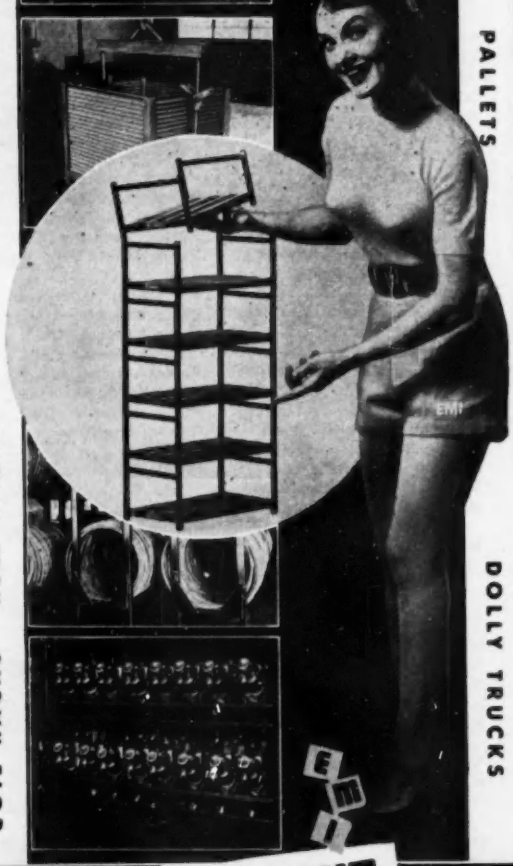

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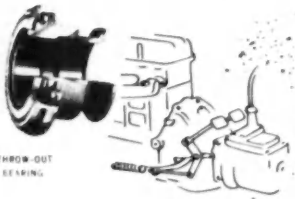

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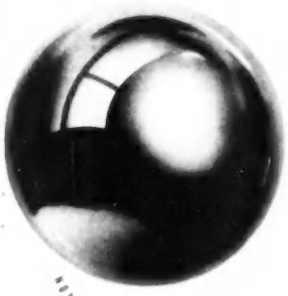

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